Chemical Age 4 June 1949

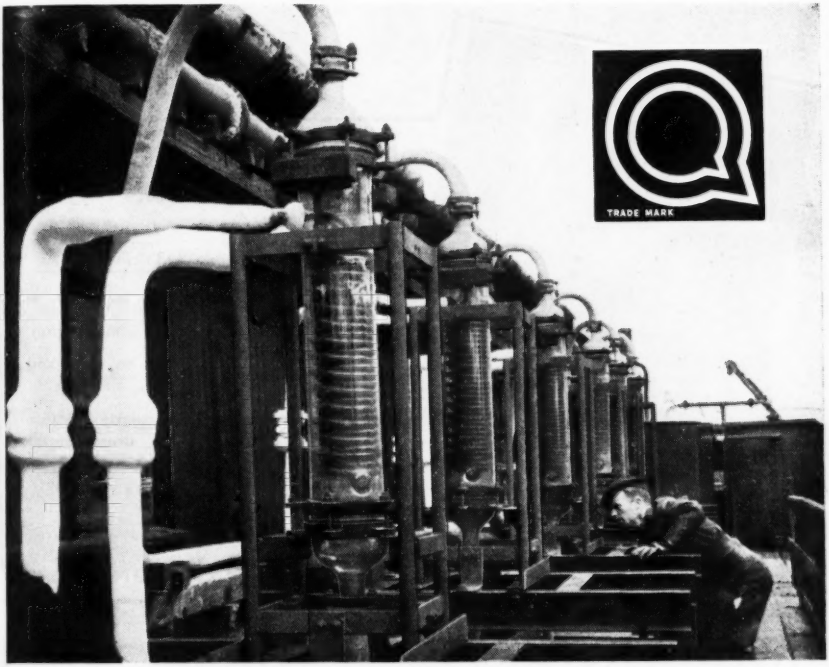
WITH METALLURGICAL SECTION

The TECHNOLOGY DEPARTMENT

CHEMICAL AGE

VOL LX 4 JUNE 1949 No. 1560

INDEX TO ADVERTISERS
IN THIS ISSUE



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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

VOL. LX
No. 1560

4 June 1949

Annual Subscription 30s.
8d. per copy, post paid, 10d.

A Chemist's View of the NPL

THE chemist enters the gates of the National Physical Laboratory with feelings of some awe. This, he says, is the place where they weigh kilogrammes to within a milligram and compare frequencies to within one part in a hundred million; this is no place for me. It is something of a relief therefore to find that the bulk of the work in progress is carried out on a more quotidian plane, the loftier heights of precision being mainly confined to the Metrology Division.

The chief items of chemical interest seem just now to be centred in the Metallurgy Division. A method for the determination of carbon in low-carbon steels has been developed and it is considerably simpler than the classical procedure. It depends on the fact that iron can be dissolved in a strong solution of copper chloride. The insoluble residue is subjected to a combustion analysis in the usual way. The results are satisfactory for samples containing as little as 0.003 per cent carbon. Another analytical development is the application of hydroxyquinoline to the estimation of vanadium. The number of estimations in which this reagent is used has grown very rapidly in recent months.

In collaboration with the Chemical Research Laboratory, an electron diffraction study of the surface oxide films produced on metals at various temperatures is yielding valuable results. In the case of iron it is found that an outer layer of hexagonal α-Fe_2O_3 overlies a cubic layer of variable composition between Fe_2O_3 and Fe_3O_4.

Several investigations of the high temperature physical chemistry of metallurgical processes are in progress, notably the reduction of titanium chloride and the interaction of "nascent" titanium with crucible ceramics. Many uses could be found for this metal in a pure state, but so far, owing to its high reactivity with refractory oxides, no economical production method has yet been devised. Titanium metal has a remarkably high corrosion resistance. It is not attacked by sea water or by any of the mineral acids except hydrofluoric.

Of less immediate chemical interest, but probably in the long run of the highest importance, is the work which has begun on industrial process control. In its own words, "the principal contributor of the Laboratory to the National Economy, apart from the maintenance of national standards, is the prosecution of research of a fundamental character, on which all technical and industrial progress is based. The special circumstances of the time have, however, given added importance to the promotion of the fullest possible use of existing knowledge, and the laboratory has therefore diverted a part of its normal function into this field."

This work is taking the form on the one hand of the improvement and development

On Other Pages

of particular electronic control devices and servo-mechanisms, and on the other of an extensive, semi-empirical investigation of the basic principles of process control. In the latter case a simplified process has been set up in which the various time constants and programme requirements can be varied at will. The effects of different combinations of proportional, integral and differential control at different points in the process can be studied. The results of this work will undoubtedly be of very great importance to the chemical industry. Eventually it is hoped to set up a testing section where the performance of commercial controllers and their suitability for particular processes can be assessed.

After the hurried and cursory tour which is all that can be made on occasions of this kind it is impossible to represent what is being done at Teddington except in terms of superficial generalisations, but the chemist is compelled to speculate on the extent to which the work of some sections of the laboratory is impeded by the fact that it is carried out in the National *Physical* Laboratory. In many modern problems neither the physicist nor the chemist in the pure sense can hope to succeed alone. The superiority of the physicist implied, however remotely, in the name is inevitably reflected in the staffing and administration, and no matter how good the co-operation with the neighbouring Chemical Research Laboratory it is unlikely to be as effective as the presence of chemists, working on equal terms, on the job.

NEW SCREW THREAD

AN optimistic view of some benefits likely to accrue from the adoption by Great Britain, the U.S.A., and Canada of the new "Unified" screw thread is expressed in a note issued by the National Physical Laboratory. A provisional specification for the new thread series is being issued by the British Standards Institution. This will be available for use by industry and will eventually be adopted by Government departments.

While the immediate impulse for unification of British and American screw thread practice came from interchangeability difficulties during the late war, it will be appreciated that such a unification would be of great value to Anglo-American trade in peacetime, observes the NPL.

The technical side of the investigation leading up to the adoption of the Unified thread form was carried out in the Engineering and Metrology Divisions of NPL, Engineering Division, and was concerned with the strength aspect. It has been found that in general the new form is somewhat stronger than the Whitworth, though the difference is only marked in cold rolled threads. There is a high degree of interchangeability between the BSW and Unified thread forms.

NOTES AND COMMENTS

Price of Nationalisation

AS an example of the preservation of a dispassionate view of a subject which is prone to arouse in onlookers a lively sense of alarm, Lord McGowan's first comment on the proposals which have been presented to the Labour Party—that Imperial Chemical Industries, Ltd., should be nationalised—is impressive. "I can definitely state that your board take the view that I.C.I. is not an appropriate subject for nationalisation," he told shareholders at the 22nd annual general meeting of the company in London on Tuesday. This was the first authoritative commentary on the proposal which, despite the scant encouragement given to it by the more responsible formulators of Socialist policy, was expected to figure largely in the proceedings of the Labour Party conference this week end. The promoters of the nationalisation project, if their motives are not merely capricious, cannot do better than ponder the very pertinent facts which the chairman of I.C.I. has now offered. Direct exports of I.C.I. chemicals last year produced the equivalent of more than £37 million. That result, says the I.C.I. chairman, who has been visiting many of the overseas markets, could not have been achieved by a commercial agency of the Government. "I can assure you," he said, "that the nationalisation of your company would generally be regarded by those with whom we trade and with whom we have joint manufacturing enterprises as a grave mistake in British commercial policy and, furthermore, as being destructive of goodwill and co-operation. . . . Not only would there be difficulties in maintaining exports . . . but countries which at present buy chemicals from Britain would be encouraged to erect plants of their own, not necessarily with British capital. . . . Quite clearly this country cannot afford the sacrifices involved."

Damaging Rumours

THE practical certainty that a cautious attitude will prevail in the present discussions of the Labour Party's industrial policy will not efface all the effects to which ill-considered talk of prospective nationalisation has given rise. Lord McGowan did not disguise the fact that irresponsible plans of this kind can inflict a lot of damage: "Veiled threats of nationalisation, even if they are not implemented, have a most disturbing effect upon existing staff and upon potential recruits to the staff," he says. "It is those members . . . and recruits who have initiative, enterprise and ability, and to whom the company must look for its future management and development, who fear most that, under nationalisation, they would be inhibited and unable to exercise that enterprise which is so vital to a company of this kind. I can hardly imagine anything more damaging to the efforts at improving the productive industry of this country and the expansion of its exports than this talk of nationalisation. Every member of your board is opposed to such a policy, and they would take all proper steps to oppose the nationalisation of your company if the attempt were ever made."

Glue and Gelatine Research

THE prospect of considerably more rapid advance in fundamental and technical knowledge at the service of the glue and gelatine industries, producers and users, is brought nearer by the appointment, which the Department of Scientific and Industrial Research announced last week, of Mr. A. G. Ward, M.A., F.Inst.P., as director of the new British Glue and Gelatine Research Association. A specialist in colloid science, particularly in the relationship between colloidal structure and mechanical properties, Mr. Ward will have great opportunities of correlating, and perhaps hastening, the work along the lines established by the pioneer co-operative investigations of the gelatine and glue manufacturers, of which the importance is manifest in the extraordinary diversity of glue and gelatine uses in industry. Now that the widened research resources and a grant are to be conferred upon the sectional enterprise, which more than half the member firms of the trade federation already are supporting, it is foreseen that the foundations of a continuing advance can be laid by giving closer attention to some fundamentals than the practical objectives

of much of the earlier work permitted. The scope in both fields, practical and fundamental, is almost unbounded. That is implicit in the commentary on the new enterprise supplied by the DSIR: "Little is known, for example, of the actual mechanism of the transformation of collagen in the raw materials to gelatine by the applications of steam or hot water and what effect different temperatures and methods have on the gelatine produced. The formation of colour in action of enzymes in causing deterioration in properties also require investigation. Practical problems include the study of glue preservatives, the water resistant properties of glue, and the suitability of different grades for different jobs."

Chemists' Gift of Colour

HOW dreary a place the world would be without colour was emphasised by a speaker at the opening recently of a new colour factory in Scotland; how few laymen—he might have added—appreciate the debt owed to the chemist for his contributions towards the conquest of drabness. This is the theme to which attention is effectively called by the issue as a booklet of the Royal Institute of Chemistry of the Fifth Dalton Lecture "Through Chemistry Adornment," delivered by Dr. C. J. T. Cronshaw, in Manchester last year. It recalls that the first dyes were all derived from natural sources such as logwood from the Bay of Campeachy, madder from France, yellow berries from Persia, orchil from the Canary Islands, cochineal from Mexico, fustic from the West indies, and barwood from Brazil. The discovery of mauve by Perkin some ten years after the death of Dalton in 1844, led to the development of synthetic colour which has continued to the present day and is still unfolding. Two outstanding events in the dyestuffs history were the completion of the synthesis of indigo in the laboratory by Baeyer, and the production of Para Red by Read Holliday. The discovery by Böttinger of Congo Red, the first dyestuff to have an affinity for the cotton fibre, had the most immediate and far-reaching effects in industry. The extension of this fundamental example of a "new look" to new fibres, wall-papers, colour printing, carpets, linoleum floor coverings, etc., was not slow. All these were among the bounty of the chemist. As Dr. Cronshaw observes: "Except for the glories of nature . . . all the adornment of colour arises from the mind and hands of the chemist at work in his laboratory." John Dalton, had he lived to see this gift of colour to man-made things would, ironically enough, have gained a distorted view of it all. He suffered from a form of colour blindness which distorted the values of red and green.

Tracers

NEWS about new methods of rendering radioactive "tracer" materials usable as extremely discriminating tools in science and industry continues to multiply at a pace which may well be spreading confusion among relevant abstractors and librarians. From the latest contributions to this rapidly growing accumulation the skilful application of the general principle for commercial purposes by the American group of the Monsanto organisation may suggest scope for related adaptations in quantity estimation. The widely adaptable carbon[14] was used in this connection, mixed with SAE 60 lubricating oil as an artificial "soil" on specimens of sheet steel and stainless steel and was used to guage the effectiveness of the company's proprietary detergent. A pre-cleaning test with a Gieger counter gave a response equivalent to some 100,000 beta impulses per minute. A further check when the specimens had been cleaned with 5 per cent of the detergent and 95 per cent anhydrous sodium metasilicate showed a drop to around two counts per minute. While this may not rank as scrupulous quantitative analysis, it may be taken to correspond fairly closely with the degree of persistence of the oil smear—and as a virtually spectacular vindication of the claims for this particular cleaning principle. It is being claimed now that estimation by radioactivity measurement is "a thousand times as sensitive as accustomed methods of detecting 'dirt'." The only discouraging factor is the necessity of "planting" the tracer material and its absence in the day-to-day estimations of unwanted substances. In this, as in conjuring, the rabbit still does not occur naturally in the hat.

Glue and Gelatine

DSIR Support for New Research Group

THE Department of Scientific and Industrial Research, announcing last week the appointment from June 1 of Mr. A. G. Ward, M.A., F.Inst.P., as director of the newly formed British Glue and Gelatine Research Association, expected to be centred in London, called attention to the narrow scope of research in this field in the past and the urgent need for widening the objectives, in recognition of the more competitive conditions now experienced in the industry. It recognises there is need for fundamental research as well as investigations leading to new and extended uses for glue and gelatine.

Increased efficiency, says the DSIR, is being obtained by replacing obsolete factories and plant, but the solution of these problems and the only way the industry can gain a lead and keep it is by the utmost use of research.

It was decided therefore in 1947 to form a research association. Preliminary work was done by the Federation of Gelatine and Glue Manufacturers, and already more than half of the member firms have joined. The research association will work along the normal co-operative lines and will be assisted by a grant from the DSIR.

Objectives

Work will be done in two main fields, (1) fundamental research on raw materials and problems affecting the industry, and (2) research with immediate practical application, including the possibility of new uses.

Mr. Ward, who has specialised in colloid materials, studied the mechanical and physical properties of propellants and plastics during the war, for the Ministry of Supply, and employed X-ray diffraction technique to observe changes in nitrocellulose structure. He has produced several papers on the rheology of pastes and two books on crystals and colloids during his service, since 1946, with the DSIR Building Research Station.

CHEAPER GROUND SULPHUR

A REDUCTION of 14s. per ton in the controlled price of ground sulphur was announced this week by the Board of Trade. The new price will be effective on June 13, adjusting the current rate of £17 17s. 6d. for the finest grades to £15 4or coarser mesh material. Both relate to bulk quantities. Previous changes have been made in April of 1947 and 1948. In the latter year an increase of approximately 12s. per ton was made. The authority for the present change is the Ground Sulphur (Prices) (Amendment) (No. 2) Order, 1949.

Linseed Oil

Paint Industry's Supply Problem

TRIBUTE to the achievements of the paint industry, in solving its linseed oil and other problems, was paid by the Parliamentary Secretary to the Board of Trade, Mr. John Edwards, at a conference of the National Paint Federation at Bournemouth last week.

Mr. Edwards spoke of the long history of the industry and its key position in many other industries. Its indirect service to the export trade and to essential home needs was even more important than its direct exports, large though these were. So far as practicable the Government would remove restrictions as soon as possible.

It was the industry's ill fortune, however, that for one of its key commodities, linseed oil, we were dependent on supplies which were exceptionally difficult for balance of payment reasons.

No Increase

Our negotiations with Argentina had proved very difficult, and although we had good supplies of linseed oil in stock, or contracted for, it was not practicable at present to increase the allocation to the paint industry. Indeed, circumstances might conceivably arise where the supply would have to be reduced, although he sincerely hoped and believed this would not be the case.

It was not easy to suggest cuts in the goods we imported from Canada and the U.S.A. to make room for more linseed oil, said Mr. Edwards. If one turned to Argentina one had to measure what one could do about linseed oil against the need for meat, feeding stuffs, hides and other materials.

The wide support given to the Paint Research Station and other activities of the industry was evidence of a vigorous sense of enterprise. He made an appeal, however, for increased direct exports of paint, particularly to the hard currency countries. Total exports of the industry in the first quarter of this year were approaching an annual rate of £10 million.

He realised that there were many special difficulties; paint manufacture was a popular local industry in many overseas countries. On the other hand Canada had recently removed her restrictions on the import of paint, and last year imported over £200,000 worth, very largely from the U.S.A. The U.S.A. was a difficult market, but we already did £100,000 worth of business there, and some members of the Federation were well equipped to get more.

There were also the markets in Central and South America; he mentioned particularly Venezuela, Colombia and Mexico.

U.S. Chemical Totals

Increasing U.K. Competition

UNITED States foreign trade in chemicals and allied products continued at high levels during 1948, reaching a total of $1134 million, or $71 million less than the 1947 high record. This is disclosed in the current summary of the Office of International Trade of the U.S. Department of Commerce, which discloses that in 1948 $858 million represented exports from the U.S.A. and $276 million was spent on imports.

Post-War Shortages

Following the end of the war, the foreign demand for U.S. chemical and allied products was tremendous, the OIT observes: By the middle of 1948, however, much of this pent-up demand had been filled and, the chemical industry in some European countries, particularly in the United Kingdom, again began to expand exports, reducing the demand for U.S. products.

This was particularly true in countries not having sufficient dollar exchange to pay for U.S. goods, except for those products not obtainable elsewhere. In addition, countries which remained neutral during the war, and built up export markets, were active last year in maintaining their trade positions. Increasing foreign production, it is foreseen, will bring increased competition in world chemical trade, and this is expected to force U.S. producers to place more emphasis on the quality of their goods as well as on newer products.

"The British Commonwealth of Nations is the dominant factor affecting our trade," states Mr. C. C. Concannon, chief of the Office of International Trade's chemical branch. "Not only do these nations take approximately 36 per cent of all our chemical and allied exports, but they furnish more than 30 per cent of our imports in this field In addition, the United Kingdom and Canada are our chief competitors in practically all foreign markets.

"The United Kingdom is expanding its export trade, often rationing domestic consumers to do so, particularly with those nations that do not have sufficient dollar exchange. Canada, on the other hand, is competing in those chemicals which are in greatest demand and therefore are purchased with the relatively few dollars now in the hands of foreign consumers."

U.S. fertiliser exports last year, because of large shipments to Korea and Japan, were 117 per cent above the 1947 figure. Medicinal and pharmaceutical preparations, chemical specialities and sulphur also were exported in greater quantities than in 1947.

(*Continued at foot of next column*)

Losses were sustained in the coal-tar products and industrial chemical groups.

The principal export items last year, in the order named, were sulphur, carbon black and caustic soda. These items accounted for 9 per cent of last year's total export of chemicals.

The chief increase in U.S. chemical imports during 1948 over those of 1947 were in coal-tar products and fertilisers. Major decreases occurred in the field of vegetable oils and waxes and industrial chemicals. Canada was the leading supplier of chemicals to the U.S.A. last year with 16 per cent of the total import volume. Argentina was second, although imports from that country were 46 per cent less than in 1947. Other important suppliers were China and Brazil for vegetable oils and waxes; India and Mexico for natural gums, resins and balsams; Chile for fertilisers; the United Kingdom for coal-tar products; and Cuba for alcohol.

Tonnage Oxygen

U.S. Has Safe Concentration Methods

THE increasing importance of tonnage oxygen in chemical, metallurgical, gas, and petroleum industries has been emphasised before American chemical engineers by Dr. Irving Roberts, of the Elliott Company, Jeanette, Pennsylvania, who disclosed progress made in the manufacture of tonnage oxygen, by concentrating the oxygen of the air.

This new process, he told a Tulsa meeting of the American Institute of Chemical Engineers, represents a marked advance in oxygen plant technology, since it eliminates completely the explosion hazard associated with previous plants. The new design also eliminates the necessity for periodic shutdowns for thawing out the plant. These advantages, he said, were revealed in a 10-ton per day pilot plant, which was subjected to extensive tests over an 18-month period.

In the U.S.A., said Dr. Roberts, eight tonnage oxygen plants are already in operation or are in the process of erection, with capacities ranging from 120 to 1000 tons a day.

In the new process, air at a pressure slightly above atmospheric is partially dried, and the remaining impurities, consisting of moisture, carbon dioxide, and acetylene, are removed in a novel heat exchanger which simultaneously cools the air to a temperature 310° below zero. The air is fed to a fractionation column from which oxygen is withdrawn as a gas from the bottom, and nitrogen is withdrawn as a gas at the top.

PRACTICAL SCIENCE REVIEWED

Royal Society's London Exhibition

SINCE its foundation by Charles II in 1660, the chief object of the Royal Society has been to create an interest in scientific research, recent developments in which were well represented in an exhibition held in conjunction with a conversazione at Burlington House, London, last week.

Among the wide variety of exhibits was a recent technique of chemical analysis, the separation of inorganic compounds by paper chromatography. The method demonstrated by the Chemical Research Laboratory, Teddington, consists of allowing a solvent to run past a test drop on a strip of filter paper and treating the paper with suitable colour-forming reagents which shows up the separated substances in a series of narrow bands.

Severe economic losses and waste of vital materials is caused by the widespread and rapid deterioration of ferrous pipes in neutral wet clay soils. This unexpected variety of corrosion—unexpected because of the neutral conditions and virtual absence of oxygen—is produced by anaerobic sulphate-reducing bacteria (*Desulphovibrio desulphuricans*).

In one exhibit by the Chemical Research Laboratory were represented the main characteristics of the bacteria, damage caused by them, and the available means of protection.

Cathodic protection has been found one of the most satisfactory means of preventing corrosion. When metal corrodes, metal ions go into solution at the anodes of electrochemical systems on the metal surface, hydrogen being discharged at the cathodes. If, however, a current is applied in such a way that the metal becomes wholly cathodic, no corrosion can take place.

Attack Diverted

To protect a buried ferrous pipeline the following methods may be adopted: The pipeline is connected to the negative pole of a low-voltage direct current supply and the positive pole to a suitable anode which may conveniently be a ground bed of scrap iron. The scrap is easily replaced when consumed.

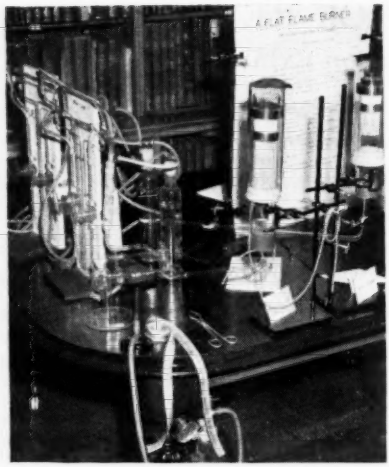
Magnesium or zinc anodes are buried about 10 ft. from the pipeline, to which they are connected by insulated wire. The anodes, too, are easily replaced

One effect of cathodic protection is to create alkaline conditions round the pipe. It is known that if conditions are sufficiently alkaline (*i.e.*, the *p*H is greater than 9.5), growth of organisms will be completely prevented. If this occurs, the method should prove effective against anærobic microbiological corrosion.

Methods of isolation, cultivation (autotrophic and heterotrophic) and inhibition were also shown.

A method of determining the velocity of slow flames by Sir Alfred Egerton and Mr. S. Thabet, of Imperial College, London, was a pretty exhibit that attracted much attention. An even velocity distribution across an upward stream line flow of combustible

One phase of the widespread use of electrical methods being demonstrated at the Chemical Research Laboratory exhibit by a DSIR research worker, Miss Margaret Thomas. This instrument, by generating a spark, reveals any flaw in pipe coatings, used in association with the cathodic protection method



The flat flame burners (right) which are of importance in studies of fuel efficiency

gas mixture was maintained. The tendency of the flame to propagate downwards was balanced by the flow of the gas, the flame remaining stationary as a flat disc. By measuring the flow (volume of gas per second) and the area of the disc, it is possible to measure the velocity of the flame accurately.

Stages in the preparation of vitamin B_{12} from liver were shown by Dr. E. Lester Smith, of Glaxo Laboratories, Ltd. Most useful methods of purification were partition chromatography on silica and adsorption chromatography on alumina and charcoal. Final crystallisation of vitamin B_{12} was from aqueous acetone.

Crystals prepared by the process of drawing from the melt, including sodium chloride, potassium bromide and silver chloride, were shown by Adam Hilger, Ltd. Large single crystals of materials such as the alkali halides are required for making prisms, lenses and windows for use in the infra-red region of the spectrum, and for such purposes as making achromatic combinations for use in the ultra-violet region.

The year 1949 marks the centenary of the determination of the mechanical equivalent of heat by Dr. J. P. Joule, and his original water-paddle apparatus was loaned by the Science Museum. As a result of his experiments Dr. Joule produced the first reliable value for the mechanical equivalent of heat.

Nuclear Physics Research

Fundamental Value of Current Effort

THE concentration of effort given to research and development of nuclear physics has raised the question whether it was desirable that so much attention should be devoted to one branch of science. There is, however, no more important scientific problem than the identification of the elementary particles in nature and the investigation of intra-nuclear forces, according to Sir Edward Appleton.

This view was expressed by the present principal of Edinburgh University and former secretary of the Department of Scientific and Industrial Research when he delivered the annual May lecture at the Institute of Metals in London last week.

Dealing with the history, organisation and research of the DSIR, Sir Edward foresaw one danger. In the large-scale work which now had to be carried out by teams of workers, many hands and many workers were required to carry out a plan conceived by one brain. Under such a system it was doubtful whether each member of the team could receive the same research training which was possible formerly when each individual built his own apparatus and used it single-handed.

The work of the DSIR, Sir Edward pointed out, was not all directed to improving the products of manufacturing industry. A great deal of it helped to ensure wise capital expenditure on public works.

He spoke appreciatively of the influence of the DSIR on private industry and of the devotion of the men and women of its staff, who enjoyed none of the limelight sometimes associated with scientific discovery.

INDUSTRIAL CHEMISTRY CONGRESS

THE 22nd International Congress of Industrial Chemistry organised by the Société de Chimie Industrielle in conjunction with the Industries Chimique Espagnoles, is to be held in Barcelona from October 23-30.

It is expected that this year's congress will be even more successful than the 21st meeting in September last year which was attended by 1400 delegates representing 28 countries.

The congress, which will be divided into 25 sections covering every form of chemical activity, will be presided over by M. Antonio Llopis in charge of the executive committee and Prof. José Agell Y. Agell, scientific and technical committee.

U.S. CHEMICAL IMPORT REGULATIONS

Advice to U.K. Exporters of Drugs and Cosmetics

ASPECTS of the stringent regulations administered by the U.S. Food and Drug Administration which call for the special consideration of British exporters of drugs and cosmetics are reviewed in an article in the *Board of Trade Journal* (27/6, 1115-6) by H.M. Counsellor (Commercial) in Washington.

A "new drug" may not be imported until an application relating to it, accompanied by the manufacturer's evidence establishing safety for use and adequacy of manufacturing controls, has been submitted to the Food and Drug Administration and becomes effective. The same rules of purity apply as in the case of foodstuffs.

All drugs which are named in the United States Pharmacopœia, the Homeopathic Pharmacopœia of the United States and the National Formulary are required to meet the standard of strength, quality or purity set forth in those compendia or failing this, the nature and extent of the difference must be plainly stated on the label.

The regulations regarding the labelling of drugs are particularly strict. The principal provisions are that the label and carton or wrapper of packaged drugs must bear the name and address of the manufacturer, packer or distributor, an accurate statement of quantity, the common or usual name of the drug and, if it is not listed in the above-mentioned compendia, the common name of each active ingredient and the amounts of certain specified ingredients.

Honest Description

The label, carton, wrapper or accompanying circular must, in addition, bear adequate directions for use and warnings against unsafe use by children or in certain conditions: labels must not mention the useful effects of a drug only, but should also disclose any harmful or deleterious effects that might be caused. As in the case of foodstuffs the container must not be so made or filled as to be misleading.

A most important rule is that the label and labelling must not bear any false or misleading statements regarding the composition of the article or the effects that it will produce. Unwarranted or extravagant representations as to the effect of a drug on diseases, for example, the use of such phrases as "blood purifier" in connection with a laxative, would lead to detention.

In the case of insulin, penicillin and streptomycin, samples of each batch manufactured must be submitted to the Food and Drug Administration and tested for purity and potency before the batch is certified for distribution.

Insecticides, fungicides and rodenticides are not dealt with under the Food, Drug and Cosmetic Act but are controlled by the Department of Agriculture in accordance with the provisions of the Federal Insecticide, Fungicide and Rodenticide Act.

The regulations applicable to cosmetics are designed in the main to ensure that such products do not contain any substance which may make them harmful to users. Labelling must not give the impression that perfumes and other cosmetics originated in a different country than the one in which they were manufactured and it must not contain any statements which are false or misleading in any particular such as describing a cosmetic cream as "nourishing," "rejuvenating," "skin food," "wrinkle remover," etc.

Coal-Tar Colours

A food, drug or cosmetic would be considered adulterated and consequently refused admission if it contained a coal-tar colour other than one from a batch that had been certified as harmless by the Food and Drug Administration. Of the 2000 or more coal-tar colours now known and made, about 200 have been tested by the administration and of these only 117 have been declared as certifiable for use (18 in foods, drugs and cosmetics, 69 in drugs and cosmetics only and 30 in externally applied drugs and cosmetics only).

Requests for the certification of certifiable coal-tar colours either for direct export to the United States or for incorporation in foods, drugs or cosmetics to be exported to the United States may be made to the Food and Drug Administration if signed by both the coal-tar colour manufacturer and his agent resident in the United States.

Copies of the regulations are available for consultation at the Commercial Relations and Exports Department of the Board of Trade, I.C. House, Millbank, London, S.W.1.

U.S. Aluminium.—Production of primary aluminium in the U.S.A. in February totalled 49,749 short tons compared with 53,356 short tons in January. The decline is attributed to the shorter month, as average daily output was slightly higher. Stocks at the end of February were 15,101 short tons, a decrease of 2209 short tons. Imports declined to 6044 short tons and exports at 2779 short tons were 719 short tons less than in January.

The Chemical Treatment of Textiles

Continuing Improvement of Appearance and Serviceability

MANY special finishes today are applied to textiles for a variety of purposes, which may be classified under three main headings: processes for adornment or enhancement of appearance; for protection or proofing; and to give increased serviceability.

In the paper "The Application of Chemistry to Textile Finishing," given as the sixth Mercer lecture to the Society of Dyers and Colourists in London recently, Mr. E. Wilson recalled how John Mercer, who lived 100 years ago, had been responsible for many advances in textile finishing and had introduced the processes of mercerising, parchmentising, and also the treatment of wool with chlorine to prevent shrinkage.

Synthetic Resins

Recent improvements of traditional methods consisted of converting the cellulose used in finishing to cellulose ethers, or better, glycol celluloses, but these were difficult to apply and there was still room for improvement. The application of synthetic resins by normal padding methods gave improved lustre, drape and handle, and a glazed finish fast to washing might also be produced.

The treatment of cotton with sulphuric acid to give an organdie finish was an old process but one on which research work was still proceeding. An essentially new product was cellulose rayon treated so as to give an organdie finish.

Delustring was an important finishing process especially for rayons which normally had a very high lustre. The original method involved the deposition of a pigment such as $BaSO_4$ on the fibres, but since this was not fast to washing and dusts out it had been replaced by an urea-formaldehyde resin which could be deposited on the fibre from aqueous solution and was fast to washing. This method was not applicable to acetate rayon, which could, however, be delustred by boiling in a solution of soap and phenol.

The most important addition to the range of chemical finishing treatments was that of crease resistance and by suitable treatment many cellulose fabrics now had a resistance equal to that of wool. The general treatment was the impregnation of the cloth with urea-formaldehyde containing an acid catalyst, usually ammonium phosphate, drying, baking at 140°C. for 2-3 minutes and then washing off.

The process required careful control, but, in addition to enhanced crease resistance, increased wet strength of the fibre and fastness of the dyestuff were also obtained. Cotton and linen required mercerisation prior to treatment and melamine could be used in place of urea.

Proofing finishes could be divided into shower, flame and moth-proofing and all these were in increasing demand. The original basis of all showerproofing treatments was the use of wax, either as such or in emulsions and solvents. It had also been used compounded with soaps and aluminium salts. Such proofs were not very durable and were removed by washing and dry cleaning. Some improvement was obtained by replacing the aluminium salts by zirconium, but this modification was largely confined to Germany and the U.S.A. owing to the availability of the salts.

Other methods consisted of using stearamide, formaldehyde and pyridine, which gave a substituted pyridinium chloride and, after baking, a highly water repellent finish. The latest method was the use of silicon compounds which leave a silicon film on the surface of the fabric, but this was still in the experimental stage.

Resistance to Attack

For mildew proofing the commonest inhibitor was salicylanilide, but substituted phenols, copper salts, fluorides and silicofluorides had all been used. Much work in recent years had been devoted to discovering mothproofing agents which would be fast to washing and dry cleaning. Substances such as para-dichlorbenzene only gave a temporary proof. Some success had been achieved with compounds which might be applied from the dye bath and were fast both to washing and dry cleaning.

Flame proofing was usually carried out with salts such as ammonium phosphate or sulphate or boric acid, but any heat treatment might cause embrittlement of the cloth from the acid of the ammonium salts. Such salts would be washed out by water, hence attempts were being made to produce a water resistant fire-proofing finish, *e.g.*, dicyandiamide and formaldehyde.

Among the chemical finishes which were applied to give increased serviceability the speaker mentioned those giving dimensional stability and increased wearing life. On cotton goods the former could largely be obtained by mechanical treatments but chemical methods must be used for rayons and wood.

Tests of Ammonium Nitrate

Results of Official Trials Under User Conditions

WHILE the foregoing trials (described in the last issue of THE CHEMICAL AGE) were of great value, it was felt that larger scale trials in which ammonium nitrate was subjected to heat were desirable. The trials envisaged were practical in character and designed to simulate the commencement and development of a fire in a ship's hold containing BA/N. Proposals were discussed by the working party, who agreed at their second meeting that such trials should proceed.

The island of Dune (Germany) was selected as a suitable site for carrying out trials involving large quantities of ammonium nitrate which might explode. A reconnaissance by members of the Explosives Storage and Transport Committee showed that two concrete shelters were available and that two steel lighters could be made available. One of the concrete shelters was unsuitable but it was considered that the other, which will be referred to as a bunker, could be filled with drums of ammonium nitrate and subjected to a fierce fire in a relatively high degree of confinement.

Typical Conditions

The lighters were considered to be valuable as they represented actual user conditions, and the filling and firing was a practical proposition. It is considered that the conditions in the bunker trial were more severe than those obtaining in a ship's hold. It was agreed at the third meeting of the working party that the following trials should be carried out :—

Bunker Trial.—Using waxed paper lined drums of ammonium nitrate lying on their sides.

Lighter CC 190 Trial.—Using waxed paper lined drums of ammonium nitrate standing on end

Lighter CH 192 Trial.—Using paper bags of ammonium nitrate.

In each trial the nitrate to be subjected to a fierce fire. The fuel to consist of chopped wood and ammonium nitrate mixed in the proportion 1 : 2.

The selection of the fuel was governed by two considerations. Plenty of scrap wood was known to be available on the island. Oxygen is necessary to burn wood and in a confined space like the bunker, or in the lighters with their hatches covered, there would be insufficient to keep the fire going well. Ammonium nitrate is an energetic oxidising agent containing 20 per cent by weight of available oxygen. Calculations and consideration of the layout suggested that if mixed with wood in the proportions 2 A/N to 1 wood, combustion would be complete. Experiments were carried out in this country at Woolwich and Shoeburyness to confirm this. At Woolwich small scale trials were carried out in tin boxes. At Shoeburyness two trials were carried out in a concrete air raid shelter which held about ¾ ton of wood.

In the first trial the shelter was filled with wood and BA/N in the proportions 1 :2 and fired. The fire developed rapidly and became very hot. A temperature of 400°C. was recorded inside an empty 5 gal. drum adjacent to the fire after 2 hours. The shelter was quite clean at the end of the trials.

Tarry Residues

In the second trial 1 : 1 mixture was tried, but the fire was much less intense and smouldered for many hours. At the end of the trial a good deal of carbonaceous matter and tarry residues were left.

The bunker in the first trial was an underground reinforced concrete room about 39 ft. long, 16 ft. wide and 10 ft. high. The walls and roof were 1 ft. thick and there was an overburden of sand about 1 ft. in depth. At one end were steps leading to a steel door. At the other was an opening leading to a small room about 7 ft. by 16 ft. by 10 ft. high. In the roof were three ventilator pipes 4 in. in diameter and another in the roof of the small room. A 5 in. diameter ventilator was situated just above floor level near to the entrance.

The drums were man-handled into the bunker and stacked five drums high and two deep along each side, leaving a 4-ft. gangway down the middle. They were not packed with geometrical precision, so that hot gases could pass freely between the drums. It was decided to light the fire at both ends of the bunker.

Combustible Mixture

A bed of wood shavings and ammonium nitrate in the proportion 1 : 2 was laid in the small room immediately under the ventilator and overlaid with some sticks of cordite. Chopped wood and ammonium nitrate (1 : 2) was then filled into the 4-ft. gangway in convenient units to the height of the drums. The sticks of wood varied in size from about 12 in. by 1 in. to 12 in. by 3 in. by 3 in. At the entrance door another bed of wood shavings and ammonium nitrate was laid. This was overlaid with sticks of cordite.

The quantities were as follows:—

BA/N in drums	70 tons (approx.)
Wood	5 tons (approx.)
BA/N mixed with wood	10 tons (approx.)

Two electric puffers wired in parallel were inserted into cambric bags containing a pyrotechnic composition (SR 371) and lashed to a string carrying a small bundle of cordite. The whole was lowered down the ventilator into the small room. At the entrance a similar procedure was adopted, but the initiating system was laid by hand.

Distant Observation

Each initiating system was connected independently to a 120-volt dry battery through a clockwork time switch. The fire was timed to start at 5 p.m. on September 29, 1948, and was observed from our boat two miles out to sea. Observation was not easy but the following remarks summarise the views of a number of observers.

The initiator in the small room fired first and a wisp of brownish smoke, probably from decomposing cordite, was seen. A short time later the priming at the door end fired. A bundle of cordite acting as a tell-tale had been placed above the shelter and connected by means of a trail to the initiating cordite. This was clearly seen burning.

Clouds of white smoke were soon seen. The colour changed to brownish after about one hour and later appeared to die down. Small tongues of flame were then seen and after 80 min. much brownish smoke was pouring out. Intermittent flames were seen for a further five hours.

On the morning of September 30, 1948, the bunker was examined. It was found to be too hot to enter and the floor at the foot of the steps was covered with a hot solution of ammonium nitrate (about 90 per cent concentration). Hot fumes were being evolved from the bunker. Only a cursory examination of the inside was possible by standing on a wooden bench dropped just outside the doorway. On October 1, 1948, the bunker was still too hot to enter but the ammonium nitrate solution had crystallised on top to a fairly firm mass and it was possible to examine the drums and interior in the vicinity of the doorway.

No Evidence of Explosion

The drums had all bulged at the ends and some were split but had remained in position. Molten ammonium nitrate had poured out from top to bottom and had set in a lava-like mass. The drums had the appearance of having been at red heat. Some large pieces of concrete had become detached from the ceiling of the bunker. The inside of the bunker was clean and free from carbonaceous residue.

There was no evidence of any explosion having occurred.

Temperature measurements and gas samples were taken during the course of the fire. A thermo-couple was inserted through the third ventilator from the door end so that the junction was immediately below the ceiling. It was connected by means of a compensating lead to a clockwork recorder housed in a nearby underground shelter.

The temperature record showed that it rose rapidly to about 80°C. and then slowly for the next 6 hours to about 150°C. A rapid rise occurred in the next hour to 400°C. It then dropped to about 250°C. for 2 hours, shot up to 350°C. for a short time and then gradually fell.

As stated above, the temperature record was taken just below the ceiling in the vicinity of the third ventilator from the steps. The record therefore shows the rise and fall of temperature at this point only. It will be understood that as the fire was started from the ends of the bunker some time would elapse before the temperature in the vicinity of the thermocouple was at its maximum.

High Temperature

As the fire developed the drums at the ends of the bunker would be heated first and remain hot as the fire proceeded to the centre of the bunker. It is reasonable to assume therefore that the temperature of the ceiling at all parts of the bunker rose to about 400°C and was at this temperature for hours.

It will also be understood that the temperature of the fire itself was considerably above 400°C., and there is evidence that the drums in contact with the fire had been at red heat. The concrete steps leading to the bunker were fitted with iron treads. These also had been red hot at some time and were buckled and twisted.

The analyses of the gas samples showed that the gases contained only about 1 per cent of oxides of nitrogen (NO and NO_2) for the first hour. After that time about 3 per cent of oxides of nitrogen (NO and NO_2) were present, increasing to about 8 per cent after 2¼ hours from the start. The indications are that for the first hour heating up was in progress without much decomposition of ammonium nitrate. After that time decomposition took place at an increasing rate.

On Saturday, October 2, 1948, it was decided that it would be some days before critical examination of the interior of the bunker could be made, and as the lighter trials were nearing completion the bunker

was destroyed to remove a possible hazard to the RAF who might bomb it

Twelve Mk. XI depth charges filled torpex had been received from the Naval Depot at Wilhelmshaven for this work. It was not safe to put them inside the hot building so they were placed on top of the roof in the centre in a rough pyramid, five at the base, four in the middle layer and three at the top. Two were primed with plastic explosive, detonators No. 8 electric inserted, and connected to a 120-volt dry battery through a clockwork time switch. The gross weight of explosive was about 1 ton. The detonation was observed from our boat two miles out to sea.

Examination of the bunker showed that it had been demolished. All the walls had been pushed out some 6-10 ft.. The roof had been destroyed and was found to be distributed around the outside of the crater which had been formed immediately below the depth charges. The bottom of the crater was about 3 ft. below the original floor level of the bunker.

Damaged Drums

Most of the drums of nitrate were still intact but damaged and displaced. Many were split or crushed and distributed with lumps of nitrate to distances up to 50 yds. There is no doubt that the drums of nitrate immediately below the depth charges and probably some of the nitrate which had melted entered into the explosion. It is estimated that about one-third of the drums were totally destroyed.

The result is not surprising and has no bearing on the main purpose of the trial but is reported as being of general interest. The barrier between the depth charges and the nitrate was about 9 in. of sand, 1 ft. of reinforced concrete and an "air-gap" of about 1-1½ ft. The nitrate was still very hot, probably around 100°C.

In the second trial the lighter CH.190 was built of steel and consisted essentially of two holds separated by a steel bulkhead. Each hold was 25 ft. long, 19 ft. wide and about 7½ ft. high. And each was provided with 2-in. thick wooden hatch covers 15 ft. by 11½ ft. and tarpaulins. The lighter was moored alongside the quay at Dune.

In both holds waxed paper lined drums of BA/N were stacked on their ends two tiers high leaving about 5 ft. on either side of the bulkhead for the fire which was prepared in the same way as for the bunker. The priming composition and cordite were placed in each hold near to the bulkhead and to one side of the lighter about 3 ft. above floor level.

Each system was connected independently with a dry battery and clockwork time switch. The two primary fires were connected by means of a cordite trail passing across the intervening deck space. The hatch covers and tarpaulins were placed in position.

Ammonium nitrate in drums in each hold, 40 tons (approx.)

Chopped wood in each hold, 40 tons (approx.)

Ammonium nitrate mixed with wood in each hold, 4 tons (approx.).

Soon after the fires were started at 1.35 p.m. on September 30, 1948, clouds of white smoke appeared.

Lighter Red Hot

The lighter was examined on the following morning, when it was found that the after-hold had burnt out. All the firewood, dunnage and hatch covers had been consumed and there was no carbonaceous residue. The drums were bulged, some were burst and some near the fire area had been displaced. Molten nitrate had poured into the fire space. The steel deck and sides of the lighter around the hold were distorted and appeared to have been at red heat.

The forward-hold was still smouldering with the hatch covers and tarpaulin still in position but charred around the edges. A thermocouple had been inserted through the hatches of this hold and the temperature record showed that the highest temperature attained was 350°C.

It was left for some hours, when it was decided that as it might burn for days and hold up the third trial an attempt should be made to remove the hatch covers and accelerate the burning. It was not practicable to get on to the lighter nor was it considered safe to disturb the covers with personnel in the near vicinity as a fierce fire and possibly explosion may have resulted.

Plastic Explosive

Opening was finally effected by lowering on to the hatches by means of an extemporised gantry a specially prepared charge of plastic explosive fitted with two No. 8 electric detonators and firing it by remote control. This was done at 6 p.m. on October 1, 1948. A large fire immediately broke out and burned intermittently until 11 p.m.

Examination on the following morning showed that the hold had burnt but the temperature reached was obviously less high than in the after-hold. The drums were blackened and some were bulged.

The reason for the slower burning is not clear. The result is not without interest however. In two adjacent holds, both containing drums of BA/N, there was a fierce fire in one which raised the steel surfaces to a red heat while in the other a slower fire carried on for about 30 hours.

There was no evidence of any explosion having occurred. The lighter was towed away, holed and beached.

Lighter CH. 192 in the third trial, was built of steel and consisted essentially of one hold 53 ft. long, 11¼ ft. wide at floor level and 14½ ft. wide at deck level, 6½ ft. high. It was covered with 2-in. thick wooden hatches 47 ft. long by 13 ft. wide. The lighter was moored alongside the quay at Dune after removal of the lighter CH.190.

Paper Containers

It was filled with 6-ply paper bags each containing 90 lb. BA/N, for 36 ft. of its length. The remaining 17 ft. of the hold was filled to a depth of about 3 ft. with a mixture of chopped wood and BA/A overlaid with more bags of BA/N.

BA/N in bags	45 tons (approx.)
Chopped wood	2½ tons ,,
BA/N mixed with wood	5 tons ,,
Weight of paper bag	1 lb. ,,

The primary fire was laid as for the first two trials low down in the lighter at the after end. It was lit at about 4.30 p.m. on October 2, 1948. In 10 min. much brown smoke was seen. This died down but shortly after copious dark brown smoke reappeared, and about 35 minutes after the commencement of the fire flames could be seen leaping to a considerable height. The fire developed much more rapidly than in the first two trials.

Examination on the morning of October 3, 1948, showed that the fire had been intense. The after-half of the hold had burnt out completely. All hatch covers were consumed. In the forward part of the hold blocks of BA/N roughly the same shape as the original bags were left but all the paper was burnt. The blocks had a glazed appearance showing that the outside had been melted. The steel deck and sides of the lighter appeared to have been red hot and were badly buckled.

Samples of Gas

Temperature records and gas samples were taken from a point about half way along the lighter immediately over the top of the bags.

The temperature record shows that there was a rise to 500°C. in 40 min. It fell to about 200°C. during the next ¾ hour and to about 100°C. during the next hour, after which it fell to air temperature in 3 hours.

It is probable that the fall in temperature from 500°C. to 200°C. was due to the hatch covers burning and collapsing, causing cool air to mix with the hot gases from the decomposing nitrate. A fierce fire undoubtedly ensued for several hours

The analyses of the gas samples show that after ¼ hour the gases contained 18½ per cent of oxides of nitrogen (NO and NO_2), which indicates that the fire developed rapidly and that the ammonium nitrate was in an advanced state of decomposition. The next sample, taken ½ hour after the commencement of the fire, consisted mainly of air.

There was no evidence of any explosion having occurred. The lighter was towed away and beached.

Conclusions arrived at from these trials are that when pure ammonium nitrate is strongly heated it decomposes with evolution of gas. If the nitrate is confined in a closed container the pressure developed may eventually burst the container. The trials carried out have produced no evidence that even with strong confinement the initial thermal decomposition of the salt will readily develop into a self accelerating explosive effect which propagates to the remainder of the nitrate to give a true explosion or detonation of the whole.

Confinement Effects

While it cannot be said that self-confinement effects which might arise with very large and deep masses of ammonium nitrate have been fully covered, the results obtained in the shell trials and with relatively large masses, including steel drum containers which would give some degree of confinement, afford reassurance with respect to the safety of British ammonium nitrate under normal conditions of storage and transport.

A feature of additional interest arising from these trials is that oxidisable matter such as paper bags when in close contact with the salt, or wood choppings when coarsely mixed with it, has not sufficed to promote the development of mass explosion. Thus safety does not appear to be menaced by the use of unbituminised paper bags or waxed paper linings to steel drums although in principle the use of such combustible materials might still be regarded as open to criticism.

When a small amount (1 per cent) of a hydrocarbon like vaseline is intimately mixed with ammonium nitrate, the behaviour of the mixture when subjected to strong heating is different from that of the pure salt. The experiments reported upon indicate that its thermal decomposition follows a different course and with strong confinement tends to become explosive and self-propagating.

Its behaviour under the conditions of the large scale trials carried out with pure ammonium nitrate has not been studied, but it is reasonable to suppose that a more vigorous decomposition would be manifested and that there would be a distinctly greater possibility of mass explosion.

FERTILISER PLACEMENT

Probable Influence on Commercial Grades

THE need for chemical and physical adaptation of fertilisers in accordance with the new information coming to light regarding the important influence of "placement" was the subject of a paper by Dr. G. W. Cooke, chemistry department, Rothamsted Experimental Station, read to members of the Fertiliser Society at the general meeting in the public hall, Harpenden, last Thursday.

Fertiliser placement, or the placing of the manure in pockets or definite bands near the seed, enabled better use of the material than was possible by mixing it with the surface soil.

Placement was by no means a recent innovation, and was in fact employed by Lawes when he first made superphosphate at Rothamsted over 100 years ago, and drilled it with the seed of turnips.

Combine Drilling

In experiments carried out in 1943 and subsequent years, generally two rates of superphosphate 1.5 and 3 cwt. per acre were tested, both drilled with the seed and broadcast. In nearly all cases the results from combine-drilling were better than from broadcasting the fertiliser.

Data given in the following table were taken from the published accounts of these experiments (E. M. Crowther, *Agriculture*, *52*, 170, 1945).

COMPARISON OF BROADCAST AND COMBINE-DRILLED SUPERPHOSPHATE FOR CEREALS
YIELDS AS PERCENTAGE OF MEAN FOR EXPERIMENT

Experiments	No Phosphate	Super Broadcast		Super Combine-drilled	
		1.5 cwt.	3 cwt.	1.5 cwt.	3 cwt.
1943 ... 8	73	94	105	105	123
1944 ... 38	71	93	106	109	121

The average yield from 1.5 cwt. of superphosphate per acre drilled with the seed was very similar to that from 3 cwt. broadcast and the yields from 3 cwt. per acre combine-drilled were much greater than those from 3 cwt. broadcast. The experiments showed that superphosphate is twice as effective combine-drilled as broadcast. Similar experiments were carried out in Scotland and have confirmed the results.

Other experiments on barley have tested potash fertiliser for cereals on light chalky soils in southern England. On such soils, 0.5 cwt. per acre of muriate of potash, combine-drilled had consistently produced as high yields as 1.0 cwt. broadcast. On other soils less deficient in potash, broadcasting the fertiliser had proved as efficient as combine-drilling. Heavy dressings of potassium and nitrogen fertilisers had damaged the germination of cereals and, in general, a dressing of mixed fertiliser to be drilled with the seed should not exceed 3 cwt. per acre and proportionately less when concentrated fertilisers were used.

Row Crops

Many farmers, impressed by the results of drilling phosphate with the seed of cereals, had attempted to modify their combine-drills to sow fertiliser with the seed of row crops such as sugar beet, swedes and peas. Such attempts had frequently resulted in serious reduction in germination and loss of plants.

For all crops other than cereals, it was better to broadcast fertiliser mixtures rather than use a combine drill which placed them in contact with the seed. Small applications drilled with the seed might occasionally be successful but the risk of damage to plant establishment was too serious for the practice to be generally recommended.

It was interesting to speculate on future trends in placement. It might be necessary to consider splitting applications of fertiliser into two parts, working some deeply into the soil and applying the remainder in a band beside the seeds so securing early rapid growth and also providing for the plant when it had a wide and deep root system.

American workers had developed deep placement methods and suggested that fertiliser should be placed in the bottom of the furrow when ploughing. Special attachments had been developed to fix on the plough to place a band of fertiliser about 8 in. deep to serve the needs of a crop in drought. The method had been given a special name—"plough sole fertilisation." Maximum fertiliser efficiency might be attained by placing most of the phosphate and potash on the furrow bottom, broadcasting the nitrogen and placing a little phosphate-potash compound beside the seed.

Liquid Ammonia

The application of liquid fertilisers was also being developed in the U.S.A. Concentrated fertilisers were dissolved in the water used for irrigation or when planting horticultural crops. Anhydrous liquid ammonia was also applied directly by special machines which had coulters that worked deeply into the soil.

Placement might have considerable influ-

ence on fertiliser development as farmers might need new types with special physical forms. The experiments described had shown the superiority of potash combine-drilled for barley on certain soils and of potash drilled beside the seed for peas.

It was extremely difficult to drill muriate of potash without special precautions and there was real need of a supply of this fertiliser either in granular form or as a freely-flowing powder. Soluble salts were very prone to damage germination and relatively insoluble forms of nitrogen and potash would be valuable for drilling with the seed at the heavier rates necessary on very poor soils. Such manures would make placement safer for the farmer to use and would simplify the design of drills and reduce corrosion of the mechanism.

The condition of the fertiliser used was of great importance as it affected drillability. Apart from questions of fineness the greatest difficulty arose from the hygroscopic nature of the salts used and from secondary changes and recrystallisation. A powdered fertiliser in satisfactorily free-flowing condition when emptied out of the bags could, in a few hours of exposure to a damp atmosphere, take up sufficient water to become a paste quite incapable of flowing through narrow apertures of commercial distributors. (Mehring and Cumings, U.S. Department Agric. *Tech. Bulletin, 182*). Settling of the fertiliser in the hoppers (which was influenced by the hydroscopicity of the material) increased delivery rates. "Bridging" in the hopper of badly conditioned fertiliser interfered with most types of gravity feed and might stop the flow completely.

Fertilisers in Ceylon

Ending of Controls

(From Our Special Correspondent)

THE fertiliser rationing scheme in Ceylon, which had been introduced owing to uncertainties with regard to the supply of fertilisers, is to be terminated forthwith as the position has greatly improved.

With the abolition of international rationing by FAO, the need for the Fertiliser Rationing and Fertiliser Control Bureau no longer exists, and the office will, therefore, be closed at the end of June.

Last year proved a difficult one for Ceylon with regard to the supply of fertilisers and it was not expected that rationing would be ended yet, as prospects for this year depended on the allocation to be made to Ceylon for 1949-50 and the regularity of shipments. Potash supplies, however, are still restricted. At the end of last year supplies were suspended owing to the disturbed conditions in Palestine and this fertiliser had to be temporarily ommitted from standard mixtures.

A number of inquiries have been made whether Ceylon is prepared to supply copra to Malaya. Last imports from Ceylon were in 1931. The international disturbances in Malaya and Indonesia have affected the Malayan coconut oil industry, and exporters of coconut oil are now keen to purchase copra from Ceylon to convert it into coconut oil. The oil content of Ceylon copra is said to be higher than that of Malaya and the oil superior to the Malayan product.

Coconut crops in Ceylon this month are expected to be very satisfactory and considerable quantities of copra and coconut oil are expected to be available for export outside the United Kingdom contract.

Copra is at present being exported at a price of Rs.1000 f.o.b. a ton, while the price of coconut oil in containers ranges between Rs.1615 and Rs.1650 a ton. The export of fresh coconuts has also reached the record price of Rs.325 a thousand nuts. Nearly one million fresh coconuts have been exported during the first four months of this year, the best markets being the Middle East and India.

"SUPERPHOSPHATES MONOPOLY"

MR. DILLON, Irish Minister for Agriculture, states that he has directed an experiment in the use of finely-ground phosphate rock for the purpose of freeing Irish agriculture and fertiliser industries from "the dictatorship of the superphosphates monopoly." He hoped that in this way an indispensable fertiliser would be made available "without having to pay a levy."

The Minister was speaking at a Press conference in the ECA offices in Dublin on the eve of the departure for the U.S.A. of Dr. T. Walsh, Senior Soils Advisory Officer of the Department of Agriculture. Dr. Walsh's visit is under the auspices of the ECA scheme to enable technicians to study American methods. Dr. Walsh, he said, was largely responsible for having built up the present soil-testing experimental project for the use of finely-ground phosphate rock. It was for the purpose of further broadening his knowledge of the scientific problems that Dr. Walsh had availed himself of the invitation to visit the U.S.A. His itinerary had been chosen with the object of visiting States where soil problems were nearly similar to those of Ireland.

ADVANCES IN CRYSTAL RESEARCH

New Data from America and Switzerland

WIDESPREAD recognition of the importance and interest of crystal formation, as developed in many fields of science, and especially in metallurgy, is providing the impetus in one of the newer and more promising fields of research. The most active interest concentrates on various applications for single crystals, with particular reference to optics and communications (electronics, etc.).

These are some of the factors recognised in an up-to-date survey of crystal research by Paul H. Egli in the *Scientific Monthly* (April, 1949, pp. 270-278).

An important new use is in ultrasonics for effecting chemical or physical changes in materials. Several methods of detecting and measuring nuclear radiation are also based on various properties of crystals.

Certain general principles, helpful in attacking the synthesis of crystals of the new material from solutions, have been established, and are briefly discussed. Some equations are evolved for N (number of units added per unit time), for $\triangle F$ or free energy change, and η_c for critical size of stable two-dimensional group. Some factors affecting growth rate are indicated, especially various methods of stirring.

Quest for Synthetic Quartz

Special attention is now being directed to the production of suitable substitutes for quartz crystals, but in every case the materials require hydrothermal synthesis. None of the possible substitutes is likely to be developed very quickly because of the scarcity of data on high temperature pressure systems involving elaborate phase equilibrium study for each crystal; and there are many difficulties in hydrothermal techniques.

Among some modern developments noted are improved methods for sodium chloride crystals, thallium halides, and silver chloride. Crystals grown from melts also have many contemporary uses, one promising one being as crystal amplifiers to replace valves in radio sets.

By extending the temperature range many new crystals have been produced, such as synthetic scheelite, and a series of similar tungstate compounds. The well-known work of Verneuil and of Linde Air Products Co. (synthetic gems) is noted; also the flame fusion synthesis of rutile (TiO_2) by Chas. H. Moore, Junr., of the Titanium Division of the National Lead Co. in America.

This material, which at present is produced only as a faintly yellow stone, has appreciably higher dispersion than the diamond, and when faceted in the same manner is an exceptionally brilliant gem. Illustrations of these and other crystals and the production apparatus were shown.

Rutile is of further interest because of its unique electrical properties. By slight variation of oxygen content this material can be changed from a super-dielectric almost to a metallic conductor, so that it promises to be a profitable substance on which to investigate fundamental electrical phenomena.

Future Scope

A great many compounds remain for which no suitable method of crystal growth has been devised, especially those which are unstable at their melting points and highly insoluble even at high temperatures and pressures. Included among these are many oxides, sulphides, and other typical semi-conductor materials needed for the study of photo-conductivity, luminescence, and similar electronic processes.

Some slight success has been achieved by growth from the vapour phase, as exemplified by work on cadmium sulphide by Frerichs. All such attempts, however, have resulted in thin plates or needles; and the vapour phase method appears inherently unsuitable for efficient crystal growth.

One possible method not yet explored is a melt process under high pressure controlled atmospheres, for which plans are under consideration. Another possibility is combustion of a neutral gas to avoid the problem of chemical reduction in the oxy-hydrogen flame fusion process.

Success in these and other directions is at the moment a basic necessity in many fields of scientific research.

Rochelle Salt Crystals

Indications, from another quarter, of successful research in synthetic crystal technique are disclosed by the English patent application of the Germinal S.A. of Lausanne, Switzerland (No. 9935/1949, Conv. date 25.1.45), claiming an improved method for the production of large Rochelle salt crystals.

It has been customary hitherto to obtain these crystals from slightly alkaline aqueous solution of Rochelle salt, somewhat supersaturated, at a temperature of about 37° C.

(*Continued at foot of next page*)

The Chemical Engineering Group

Services to the SCI Acknowledged

At the dinner, which followed the thirtieth annual general meeting of the Chemical Engineering Group of the Society of Chemical Industry, held at the Waldorf Hotel, London, on May 25, Mr. Julian M. Leonard (retiring chairman of the group), presided and, in proposing the toast of "The Society of Chemical Industry," stressed the importance of the group as part of the SCI. Thirty-five of those members who signed the original articles of association of what was now the parent body had signed as chemical engineers. Even if they were not the most important group—which he claimed they were—they were certainly the oldest.

It was a wonder, he observed, in view of the strength and importance of their group, that the first suggested title of the main body—that of "The Society of Chemical Engineers"— had not been persisted in. Their group had given much in service to the main body. Mr. Leonard gave a resumé of the history of the SCI, from the meeting at Owens College, Manchester, 1876, when it was first proposed that it should come into being and be local in character, and its inauguration as a national body in 1881, to the present day, citing the formation of its numerous branches and sectional groups in various parts of the country and overseas.

Membership of the SCI was growing, and he believed the society was really "on the crest of the wave."

Mr. Stanley Robson, chairman of the SCI council, replying to the toast, said the Chemical Engineering Group was, indeed, entitled to claim to have done much in the development of the SCI. Its distinguishing feature had been that of a catalyst in the parent body.

Not only had the group rendered good service to the parent society, but it had been the beginning of the Institution of Chemical Engineers, whose president, Prof. Newitt, was their guest. That was parentage of which the group could be proud.

The SCI had rallied to its ranks members from many countries. It had a section in America, which was only smaller than the London section. It also had sections in Dublin, Canada, and Australia.

The toast of "Our Guests" was proposed by Dr. Herbert Levinstein, a past-president of the SCI, and he coupled with it the name of Col. Walter Elliot, M.C.

Col. Walter Elliot, replying, said he frequently found himself as one of the guests who seemed considerably to outnumber their hosts. His only connection, personally, with the chemical industry, was that he had married a daughter of Sir Charles Tennant, whose name needed no refreshing in the minds of those connected with heavy chemistry.

At the annual general meeting, the following were elected to fill vacancies on the general committee of the group:—Mr. Julian M Leonard, Dr. W. Idris Jones, Mr. R. C. Odams, Mr. J. L. Sweeten. Mr. Norman C. Fraser was appointed chairman, and the following were re-appointed:—Hon. secretary, E. leQ. Herbert; hon. treasurer, Mr. F. A. Greene; hon. editor, Mr. D. M. Wilson; hon. recorder, Mr. H. W. Thorp.

ADVANCES IN CRYSTAL RESEARCH

(Continued from previous page)

After further heating to 50° C. the solution was poured into a hard rubber tray, previously preheated, in the bottom of which were several slots, each containing a long slender Rochelle salt seed.

A rubber cover was clamped over the tray to reduce evaporation of solvent, and the solution stirred by rocking, while temperature was slowly reduced for a period. The salt was thus forced out of solution and deposited on the seeds, whereby large, clear crystals were obtained.

In the present invention the seed crystal is planted in a concentrated aqueous solution of Rochelle salt at a given temperature, with relative motion produced between the seed and the solution. Crystallisation is produced by lowering the temperature at such rate that the average deposition of Rochelle salt expressed in g./24 hr./sq. in. is between 1.6 and 2 for a temperature drop of about 15° C. The claim is made for more rapid growth and greater uniformity in size, as well as better quality.

Diagrams are given of temperature curves and of equipment required. The rate of relative movement is sufficiently high for deposition of clear crystalline material; and low enough to prevent the solution from breaking down. The following is offered as an example: Four seed pieces of Rochelle salt, each about 17 in. long and 3 in. wide, are placed in a tray 24 in. by 30 in. containing 24 litres of concentrated aqueous solution of Rochelle salt at a given temperature.

Relative motion between seed pieces and solution is effected by rocking the tray through an angle of 9° to 18° with a frequency of at least four cycles per minute. The temperature drop is at the rate mentioned.

Metallurgical Section

Published the first Saturday in the month

Metallurgical Section

4 June 1949

GERMAN POWDER METALLURGY

Overall Survey of German Wartime Advances

THE British Intelligence Objectives Sub-Committee is rendering a very useful service to industry by summarising in a series of overall reports the vast mass of technical information that was obtained from the Germans after the war. These reports, prepared by experts in the particular subjects, represent critical estimates of German developments, of which the latest is "Powder Metallurgy in Germany —1939-1945."

In this field the outstanding achievements in Germany were the large-scale manufacture of iron powders and sintered iron shell driving bands, and an equally impressive manufacture of tungsten carbide for tools and armour-piercing shot.

While the latter development was eventually equalled in this country, in spite of the lead that Krupps had enjoyed for many years before the war, there was nothing comparable outside Germany with the sintered iron shell driving band project. It eventually reached the proportions of a major industry, according to this report, and figures actually quoted for the entire war period are 100,000 tons of iron powder manufactured and 1000 million sintered iron driving bands, and upwards of 200 million sintered iron bullet cores. Considerable numbers of rifle and revolver feeder parts were also made by means of iron powder metallurgy.

Three Methods

The Germans received shipments of Swedish sponge iron powder throughout the war, amounting up to 300 tons per month in 1944-45, but this was diverted to a large extent to the manufacture of magnetic dust cores. Germany's requirements on the enormous scale mentioned were satisfied by three different and competitive processes. The least economical of these, the Hametag eddy-mill process, was most widely used, for two reasons.

First, the powder produced had excellent pressing and sintering properties, and, second, the mills were available in large numbers at widely scattered places.

The next process in order of importance was the DPG disc-atomising process, in which molten metal was atomised and simultaneously comminuted by rapidly rotating stainless steel blades.

The third process was the so-called RZ process in which molten pig iron was atomised with compressed air to give a correct carbon-oxygen ratio. Both of these impurities were then removed as CO_2 by subsequent annealing.

The report points out that although much use has probably been made of various German innovations by the powder metallurgy industry in this country, there is still some scope for at least one Hametag plant, and perhaps also for the RZ process, provided there is an adequate demand for iron powders.

Standardisation

In the section on hard-metal carbides, reference is made principally to the work done at Krupps. Hot-pressing was a notable feature of manufacturing there, and a high degree of standardisation was introduced. Compared with a number of 360 shapes and sizes listed in Krupps' pre-war catalogue, the total was eventually reduced to 41, and each of the 10 different grades produced had rigidly specified uses. These grades were also made from carefully allotted raw materials which were apparently received in a variety of forms.

Several substitutes for tungsten carbide were developed to overcome the great tungsten shortage that existed in Germany. Krupps used a composition of 45 per cent titanium carbide and 45 per cent vanadium carbide bonded with 10 per cent nickel, while the Metallwerk Plansee preferred 75-80 per cent titanium carbide and 5-15 per cent molybdenum carbide, with 10-13 per cent nickel as binder. These substitutes, however, were not entirely satisfactory and owed their existence only to the tungsten shortage.

Sintered Alnico magnets and a wide range of magnetic dust cores were made, as well as electrical contacts and a number of specialities in the electronic field. The

(*Continued at foot of next page*)

Production and Stocks of Non-Ferrous Metals

A MARKED rise in April in Government stocks of some non-ferrous metals, accompanying the devaluation on world markets, is disclosed in the particulars of United Kingdom production, stocks, consumption, imports and exports. These results are presented in the monthly figures supplied by the British Bureau of Non-ferrous Metal Statistics, a representative abstract of which is offered in the accompanying tables.

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS :		
Govt. and consumers'	29,112	70,274
Imports into U.K.	12,954	18,568
PRODUCTION :		
Primary	—	5,200
Secondary	2,818	5,518
CONSUMPTION :		
Primary	5,253	23,192
Secondary	—	14,474
EXPORTS FROM U.K.	1,305	23
CLOSING STOCKS :		
Govt. and consumers'	37,344	78,009

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	23,511 long tons
Alloyed copper products	20,051 ,, ,,
Copper sulphate	2,900 ,, ,,

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS :		
Govt. and consumers'	14,925	41,570
Imports	5,614	18,491
PRODUCTION :		
Virgin and remelted	—	4,788
CONSUMPTION :		
Virgin (incl. debased)	5,614	13,571
Remelted and scrap	—	6,929
EXPORTS	—	121
CLOSING STOCKS :		
Govt. and consumers'	14,723	50,580

LEAD

	Long Tons			Lead Content of secondary scrap and Residues
	Lead in Concentrates	Imported Virgin Lead	English Refined	
OPENING STOCKS :				
Other than Govt. and consumers'	46	21,842*	1,831*	—
IMPORTS	—	24,280	—	46
PRODUCTION ...	166	—	2,373	—
CONSUMPTION ...	158	10,575	3,411	8,866
EXPORTS	—	177	—	—
CLOSING STOCKS :				
Other than Govt. and consumers'	54	33,147*	793*	—

* Govt. and consumers'

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS AT END OF PERIOD	13,780
IMPORTS	89
PRODUCTION	2,366
CONSUMPTION	1,533
EXPORTS AND RE-EXPORTS	129

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	345
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	251

CADMIUM

TOTAL CONSUMPTION OF CADMIUM	28.35

GERMAN POWDER METALLURGY

(*Continued from previous page*)

Telefunken Co. succeeded in making thorium sheet, rod and wire from thorium powder obtained by vacuum reduction of thoria, the product being wet-ground in hydrochloric acid. Thorium was also used for coating valve parts and as a getter material.

Some interesting fundamental work was also done on the properties of compacts made from refractory oxide powders, but the Germans were not successful in making gas turbine blades either from these oxide powders or from mixtures of them with metal powders. This is, perhaps, one of the most promising applications of powder metallurgy at present, in which the Germans were not making much headway in 1945.

German production of aluminium powder for explosives, etc., amounted to 22,000 tons per annum, of which 12,000 tons were flake powder and 10,000 tons atomised powder. The peak war-time output of the British flake powder industry was 1400-1500 tons per annum, and it would be interesting to know what has happened during the last few years to this enormous excess production capacity in Germany, in view of the war potential of a flake powder industry.

Overall Report No. 20 is on sale at HMSO (6d.).

CRACKING OF SOFT STEEL

THE causes of the inter-crystalline corrosion of steel are the subject of a paper by Messrs. Smialowski, Kopek and Michalik of the Metallurgical Research Institute, Gliwice, Poland, which is reproduced in the March issue of *Hutnické Listy*, the monthly review of the Czechoslovak Metallurgical Works (National Corporation) and of the Czech Foundrymen's Association.

The authors then describe their own testing methods, giving results of the effect of 40 per cent boiling NH_4O_3 on the tensile and bend strength of a test piece.

The effects of the composition of the solution, the steel composition, plastics and thermal treatment, steel structure and surface condition on the cracking speed are dealt with, and further research on corrosion-crack formation and the formation of nitrogen during the corrosion, is described.

ACID METAL CLEANING

Time-Saving Technique with Sulphuric Acid

THE acid cleaning of steel wire and sheet is one of those fundamental processes of the fabricating section of the metal industries to which a substantial amount of research is deservedly being given. Among the results already achieved are means of expediting the cleaning processes, and there has been a noticeable increase of the adoption of sulphuric acid as the cleaning agent, in the place of the more traditional hydrochloric acid (muriatic).

Although muriatic is still the acid chiefly employed in Great Britain, it is estimated that 90 per cent of the American industry using similar steel qualities uses sulphuric acid. The cost of steam, essential for economic sulphuric pickling, is usually stated as the reason for the British preference for muriatic acid, which functions efficiently at atmospheric temperatures.

Sulphuric acid solutions, although necessitating a closer attention to detail to maintain solution strength, are more rapid in attack, and in charge of a competent operator more economical. There is also less risk of acid rust, a defect in muriatic cleaning which never fails to show if washing has been inefficiently performed, or immersion prolonged.

Scale Removal

The common assumption that scale is dissolved away is erroneous. A little solvent action does take place, but the process is equally physical as chemical. Scale (oxide of iron), being porous, permits acid to percolate to metal with the resultant evolution of hydrogen gas. This, as it accumulates, loosens and forces away the scale from underlying metal.

For sulphuric cleaning of carbon steels (not stainless), a solution strength of 5 per cent sulphuric acid at 60° to 80° C. is considered best. A rise of 10° over 60° C. will almost halve immersion time, but there is a proportional decrease in solution strength

For efficient processing it is essential that the solution be kept at a constant temperature by means of a thermostatic steam valve, or the installation of a temperature recorder to enable the operator to vary the inflow of steam as required. Acid concentration is equally important, and as strength decreases, due to steam dilution, the general practice is to add fresh acid after each batch.

The decrease in solution strength due to steam dilution has been one of the chief factors against the adoption of sulphuric pickling in general, but the problem has been the subject of much research, one result of which has been a method in which not only is the solution kept up to strength, but has in fact to be diluted at intervals because of the concentration of acid liquor.

The process, the "Submerged Combustion" method, is, briefly, the functioning of an air-gas unit fixed to the inner floor of the acid tank, in which products of combustion are actually consumed in the solution.

Air and Gas

The components of the unit are a burner, in which is fitted an ignition point and pilot flame, and facilities for producing what is known as the main flame. An air compressor is employed to provide air at a pressure sufficient to overcome the head of the solution in the tank, and to clear the burner of liquid.

An automatic control system then begins to operate, first heating the ignition point to incandescence by means of an high amperage, low voltage current, and this is followed after a predetermined time by a flow of pilot gas, which is ignited. The main gas follows, to be ignited in turn, and the air-gas ratio is automatically controlled.

As the unit is situated below solution level the combustion chamber is effectively cooled by surrounding liquor. The products of combustion are projected directly into solution. Air turbulence, in addition to keeping the combustion chamber free of liquor, also agitates the solution, promoting a decrease in immersion time and maintaining strength and temperature at uniform levels throughout the tank.

Loss of Water

The phenomenon that the solution gains in concentration, rather than becoming weaker, as is normally the case, is, of course, due to the direct firing into the solution with its resultant evaporation of water.

When the current is shut off, the solution seeks its own level, filling the combustion chamber and part of burner manifold, but is expelled by air pressure on re-starting.

In pickling steel sheets for galvanising, particularly in machine pickling, sulphuric acid solutions are stated to have proved more economical than muriatic acid, reducing both labour and acid costs. It seems to be generally accepted, however, that passing the work through a weak solution of dilute muriatic after sulphuric acid processing often improves the surface condition. (*Continued overleaf.*)

An economical muriatic acid solution for general purposes is one part of commercial acid to two parts by volume of water, and this solution can be worked until it is exhausted. Conflicting opinions exist as to the merits of this method, as against the addition of fresh acid to build up strength, but the chief factor in both is the quality of the material and depth of scale to be eliminated

Lime Liquor Treatment

In the acid cleaning of wire and wire rods, the coils are dipped in lime liquor after washing at the termination of the immersion. The dipping serves two purposes; assisting to neutralise the acid still present in pores of metal; and acting as a lubricant carrier in a later cold deformation or drawing operation.

An essential operation in acid cleaning of wire material is drying-off after immersion in the lime liquor. Acid in the form of occluded hydrogen is still present in the pores of the metal, and to eliminate it the material is baked at a temperature of 250° C. The lime coat dries rapidly at this temperature, but acid is still present and, to clear it, the material requires to be exposed to this heat for at least two hours after completion of the drying.

Steel sheet cleaning for the further process of tin-plating or galvanising is almost exclusively performed with sulphuric acid and machine pickling. A common pickling solution is of 5 per cent sulphuric acid and is worked at temperatures around 90° C., at which temperature immersion time rarely exceeds four minutes.

The pickling of steel sheets for pressings, stampings, etc., has, naturally, a far-reaching effect upon the quality of finished product. The formation of blisters during pickling is usually attributed to over-immersion and, while this is no doubt one factor, the majority of such imperfections are likely to be due to non-metallic material on the surface of the treated steel. Such impurities take up large amounts of hydrogen and thus cause the surface to rise.

All methods of acid cleaning of steels involve a risk of defects due to hydrogen embrittlement, and the higher the carbon content the greater is the risk. Hydrogen embrittlement is a condition of low ductility, due to excessive adsorption of hydrogen. The atomic lattice of iron acts as a diaphragm, which permits hydrogen atoms to penetrate the metal during pickling, but prevents them from subsequently pairing to form the H_2 molecule, the stable, gaseous form.

Controlled Action

In recent years, products termed "inhibitors" or "restrainers" have been introduced for the purpose of reducing acid action on exposed metal during processing until the surface matter on other parts has been dislodged.

Various claims have been made for these products, particularly their efficiency in eliminating any tendency to acid brittleness in high carbon steels, and they appear now to have overcome the suspicion with which they were originally regarded and to have gained wide acceptance.

New Protective Surface Treatment of Aluminium

A NEW chemical formulation called Alodine, developed in the laboratories of the American Chemical Paint Company, Ambler, Pennsylvania, which reacts with aluminium metal to produce high corrosion resistance and durable paint-bonding, is claimed by the company to provide a quick simple and low-cost protective treatment for aluminium and its alloys.

The new chemical can be applied to aluminium parts by dipping, spraying, or brushing, and it is claimed that practically every type of aluminium structure and sub-assembly, including aeroplanes and buildings can be successfully treated.

In the immersion process, aluminium parts are treated in tanks in less than two minutes. When parts are power sprayed, the aluminium is "alodised" in 30 seconds. Brush treatment for large assemblies is said to require no more time than is necessary to apply the chemicals and wash the surface with water. The Alodine processing chemicals, according to the company, are comparatively low-cost and the short processing time and the simplicity of equipment used reduce the cost of application.

The non-electrolytic nature of the process eliminates power cost and there is considerable savings in steam because Alodine is used at low temperatures. For dipping or spraying the chemical bath is heated to only slightly above room temperature.

Belgian Congo Metals. — The *Union Minière du Haut-Katanga* and the *Société de la Vieille Montagne* have collaborated in the formation of a metallurgical company, the *Société Metallurgique du Katanga*, with capital of 262.5 million Belgian francs. A factory is to be constructed at Kolwezi, the new mining centre in the West Congo.

INTERNATIONAL TIN RESEARCH

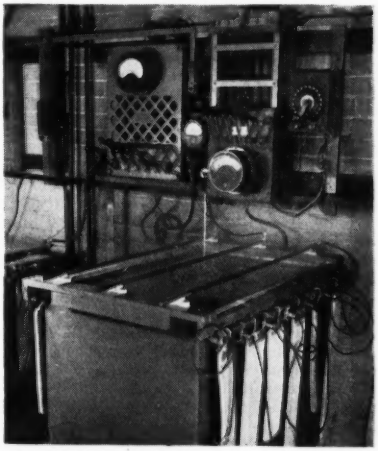
Report on Institute's Wide Range of Activities

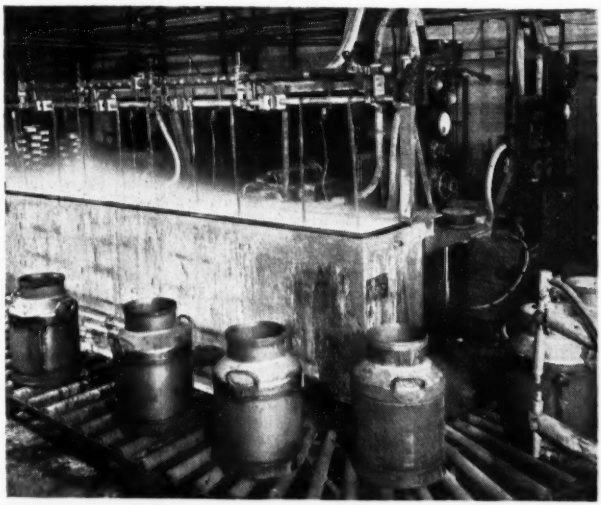
THE report on the work of the Tin Research Institute, 1947-1948, which has recently been issued in the form of an illustrated 34-page booklet, reviews its activities during the period of recovery from the special conditions imposed by the war and describes the field of work envisaged for the future. This includes more extensive research facilities and improved technical service for the tin consuming industries.

During the past two years the director and several members of the staff have visited America, France, Holland, Belgium, Switzerland and Italy to renew contracts severed by the war and to secure first-hand knowledge of local problems and conditions. The research and development teams have been strengthened by the appointment of senior investigators with experience in certain specialised fields, such as corrosion and electrodeposition.

Extensions and alterations now being made to the existing headquarters at Greenford, Middlesex, will more than double the available laboratory space and provide much needed accommodation for the expansion of research and development work on tinplate, hot-tinning, bronze founding, bearing alloys and the electrodeposition of tin-alloy coatings.

The use of tin as a protective coating is considered to be its most important application. Corrosion stations, situated in six widely separated parts of Great Britain and at three points in the United States of America, are being used to study the corrosion-resisting properties of tin and tin-alloy coatings under conditions likely to be encountered in service.





The tin-zinc plating bath (top right) gives a coating of alloy consisting of 80 per cent tin and 20 per cent zinc. This is being increasingly used for the protection of steel against rusting. Right: Plant used for the electrolytic degreasing of steel milk cans prior to pickling and tinning

Courtesy of Clare's Services

It has already been shown that a thin coating of tin on steel is an excellent basis for paint, and tin, or tin-lead solder, is now being applied for this purpose to the edges of motor-car body panels. New methods of applying tin locally to steel are being investigated.

Alloy coatings, containing 80 per cent of tin and 20 per cent of zinc, are being increasingly used for the protection of steel, particularly in the electrical field, where their good corrosion resistance and excellent solderability are proving advantageous.

The electrodeposited coating called speculum plate, containing about 42 per cent tin and 58 per cent copper, provides an attractive finish for articles employed in the home. Its advantages are a bright silvery-white appearance, resistance to wear, and freedom from tarnishing.

Research on electro-tinning has been intensified. A new plating bath is being investigated; this has been found to afford a wider range of current densities than has hitherto been possible with still solutions.

The hot-tinning laboratory has recently been equipped with modern industrial-sized plant, suitable for investigating the problems encountered by tinplate manufacturers and tinners. A new booklet of 35,000 words on "Hot-Tinning" has been completed and is now in the press.

Problems associated with the production of relatively small chill-castings have been solved and attention is being devoted to the continuous casting of bronze rods and tubes, and to the improvement of sand-cast bronzes. A comprehensive text-book by Dr. W. T. Pell-Walpole and Prof. D. Hanson is nearing publication.

A new booklet, "Notes on Soldering," summarising the latest available information on the composition, properties, and methods of using soft solders, has been well received by the technical Press and over 10,000 copies have already been distributed.

The relative merits of the various alloys used in journal bearings have been investigated and attention is being devoted to improvements in manufacturing techniques. The results of some of this work have been summarised in a booklet entitled "Babbitt Alloys for Plain Bearings."

Lectures have been delivered to technical societies, and educative materials, such as films, lantern slides, lecture notes and collections of products, illustrating the uses of tin, have been supplied to schools.

Dr. J. W. Cuthbertson, assistant director of research of the institute, who has recently visited the U.S.A., summarises the impressions gained in surveying American trends and practice in the production of bronze, collapsible tubes, solder and bearings and in the electrodeposition and chemical fields.

New offices where technical experts are available for consultation and practical assistance on any problems concerned with the uses of tin have been opened in Belgium and the U.S.A.

Subsidies for Indian Aluminium Producers

THE decision of the Government of India that the Indian Aluminium Company and the Aluminium Corporation of India should be subsidised, is contained in a resolution on the Tariff Board's report relating to the aluminium industry. The concerns are to be subsidised to the extent of the difference between the fair selling price of their products, having regard to their respective costs of production, and the fair selling price of similar imported articles. Such assistance will be guaranteed for an initial period of three years.

The existing pool arrangements in regard to aluminium have been wound up and the import of aluminium ingots, sheets and circles will be allowed freely, consistently with the exchange position. The rates of subsidy will be, in the case of the Indian Aluminium Company, Rs.320 per ton on sheets and circles in 1949-50, Rs.230 in 1950-51 and Rs.130 in 1951-52. In the case of the Aluminium Corporation Rs.710 per ton on sheets and circles, and Rs.900 per ton on ingots in 1949-50, and corresponding rates for 1950-51 will be Rs.610 and Rs.825 and for the year 1951-52 Rs.510 and Rs.750.

The subsidy will be met largely out of the additional revenue that is expected to be realised by the enhanced import duties. The scheme involves the continued levy of import duty at the existing rate of 30 per cent *ad valorem* and the levy, in addition, of specific duties. The levy per ton on ingots for the three years in question will be Rs.328, Rs.237 and Rs.146, and on sheets, strips and circles Rs.121, Rs.46 and nil.

Technical Publications

INTENSIVE investigation to devise a means of welding aluminium and other light alloys without the aid of the corrosive type of flux used in gas welding have resulted in the development by the British Oxygen Co., Ltd., of the Argonarc process. By this method the heat source is obtained by striking an arc between the work-piece and a tungsten electrode; if it is necessary to use a filler rod, this is added separately in a manner similar to that used in normal gas welding. Throughout the operation, the electrode, the arc and the welding zone are completely shielded by an atmosphere of the inert gas argon, which prevents atmospheric oxidation and the formation of nitrides and other impurities in the molten weld metal. The equipment, which falls into three main groups, the torch, the argon supply, and the power supply, are described in an illustrated brochure just issued by the company.

* * *

A chemical directory of the Netherlands giving classified lists of the chemicals and chemical products, and a directory of producers and manufacturers has been issued by Bureau Voor Bedrijfsdocumentatie, of Hilversum and Antwerp. Abridged lists of chemicals and chemical products are given in English and French.

* * *

In the choice of specialised laboratory balances, the knowledge that an instrument is available at once, instead of after a lapse of months, as is so often the case, is an important factor. This is one of the advantages of the Nivoc aperiodic balances described in the latest leaflet issued by W. & J. George and Becker, Ltd., London. The balance is claimed to have easy manipulation, a capacity of 200 g. and a sensitivity of 0.1 mg.

* * *

The nineteenth edition of the British Plastics Year Book for 1949 (Associated Iliffe Publications) is a valuable source of information on a subject which has acquired significance for a great number of diverse industries. The book is divided into nine sections: 1, General (review of recent patents and specifications); 2, Materials (raw materials including resins, solvent and plasticisers); 3, Manufactured products; 4, Plant and equipment (engineering and chemical); 5, Glossaries; 6, Names and addresses; 7, Who's who (prominent people in the industry); 8, Associations and federations; 9, Technical and general data.

Technical information on four of the newer aids in metal finishing processes is summarised in four slim folders issued by Jenolite, Ltd., London. These deal with Jenolite rust remover and neutraliser; a powder degreaser for removal of oil and grease from iron, steel, brass and bronze; aluminium keying solution for surface preparation; and a black finish for iron and steel which is lasting and durable.

* * *

Practical data on Celanese chemicals is given in the brochure now available from the Celanese Corporation of America (Chemical Division), New York. The bulletins deal with U.S.P. formaldehyde, acetone, methanol, glacial acetic acid, *n*-propanol, acetaldehyde, tricresyl phosphate, methylal, propionaldehyde and give their specifications, physical properties, chemical reactions, toxicology as well as much practical data relating to use and handling.

* * *

"Chemical Products" is the title of a new booklet giving technical information on the characteristics of available chemicals, supplied by Kaylene, Ltd., London. The lists are divided into pharmaceutical, reagents, industrial and miscellaneous chemicals and intermediates there is also a general alphabetical index.

* * *

A flash-lamp suitable for the illumination of vapour tracks in the Wilson cloud chamber is the subject of one of the main articles in *Philips Technical Review*, Vol. 10, No. 6 (Philips Electrical, Ltd., London).

* * *

A brochure newly issued by Savory & Moore, Ltd., refers to a new synthetic antispasmodic Neo-Octon (Knoll) for the relief of smooth muscle spasm. The new product is available in the form of tablets and drops for oral use and ampoules for parenteral injection. The drug is claimed to be notably free from side-effects.

* * *

The Westinghouse Electric Corporation, Pittsburgh, has published a new 15-page booklet on "Phos-copper," a uniform brazing alloy for copper, brass and bronze. Extrusion and its contribution to better brazing is discussed, and eight methods of brazing with phos-copper are described—gas brazing, dip brazing, incandescent carbon brazing, high frequency induction, arc torch brazing, carbon arc, and spot welder.

The Institute of Metals

Awards and Appointments

THE Capper Pass Awards for 1948 have been announced by the adjudicating committee on behalf of the councils of the Institution of Mining and Metallurgy and of the Institute of Metals, as follows:—

Messrs. C. Blazey, L. Broad, W. S. Gummer and D. P. Thompson (Metal Manufacturers, Ltd., Port Kembla, N.S.W., Australia) £50 jointly for a paper on "The Flow of Metal in Tube Extrusion," published in the *Journal of the Institute of Metals*, 1948, Vol. 75, December.

Mr. H. B. Potts (Minas de Rio Tinto) £50 for a paper on "Further Notes on Converter Practice at Rio Tinto," published in the *Bulletin of the Institution of Mining and Metallurgy*, 1948, March.

Messrs. R. C. Trumbull (Pyrites Co., Inc.), W. Hardiek (Pyrites Co., Inc.), and E. G. Lawford (Rio Tinto Co., Ltd.) £50 jointly for a paper on "Notes on the Treatment of Pyrites Cinders at the Plant of the Pyrites Co., Inc., Wilmington, Deleware," published in the *Bulletin of the Institution of Mining and Metallurgy*, 1948, December.

The awards are made annually from a sum of £200 presented by Messrs. Capper Pass & Son, Ltd., Bristol, the amount being equally divided for one or more awards to authors of papers on some aspect of non-ferrous extraction metallurgy, and for one or more awards to authors of papers relating to some process or plant used in the fabrication of non-ferrous metals contributed by persons engaged full time in industrial practice.

The council of the Institute of Metals (London) has appointed the following members to be honorary corresponding members to the council for their respective countries:—

Belgium: Henri Feron, administrateur-directeur, Visseries et Tréfileries Réunies, S.A. Haren.

Holland: Max Hamburger, director Royal Nederlandsche Lood-en Zinkplatterijen voorhen A.D., Hamburger, Utrecht.

Italy: Dott. Leno Matteoli, vice-director, Istituto Scientifico Technico Ernesto Breda, Sesto S. Giovanni, Milano.

Spain: PROF. J. ORLAND, Instituto Católico de Artes e Industrias, Madrid.

Sweden: PROF. A. G. E. HULTGREN, professor of metallography, Tegniska Högskolan, Stockholm (additional member).

U.S.A.: PROF. R. F. MEHL, Carnegie Institute of Technology, Pa. (additional member); and DR. R. A. WILKINS, Revere Copper and Brass, Inc., Rome, N.Y. (additional member).

New Vacuum Process for Alloy Casting

THE development of a new vacuum process for refining and casting, which holds promise of increasing the versatility of high-strength alloys of steels and other metals, is announced by a newly formed firm, the Vacuum Casting Corporation, Philadelphia, Pa., U.S.A. Owing to the importance of high-strength alloys in defence production, U.S. military authorities have ordered the withholding of details of the new process, states Mr. D. Von Ludwig, of New York, its inventor and a signatory of the new company. It is claimed by the firm that this vacuum casting method provides a revolutionary series of improvements in the metallurgical, electrical and physical properties of cast metal.

The major fields of application for the new process are stated by the inventor to be in the casting of ingots and in precision casting of finished parts. High-strength alloys of steel cast from the melt by the new process can be given far greater ductility than at present, it is claimed, making them suitable for a variety of forming operations other than forging. In addition, the process is said to open up the possibility of precision casting of many parts from alloys of titanium, magnesium, chromium or molybdenum, for use under conditions of higher temperatures, pressures and general abuse in service.

Under this new process, it is explained, nitrogen present in the atmosphere is eliminated by casting metals in a vacuum, thereby avoiding nitrogen combining with alloys to form nitrates which give brittleness to the finished castings, as in existing casting methods. Mr. Von Ludwig also claims that compressors for jet engines, ordinarily made from scarce cobalt alloys, can by the new vacuum method be precision cast from other alloys

American Chemical Notebook

(From Our New York Correspondent)

OFFICIALS of the National Distillers Chemical Corporation, New York, have announced that work has been started on a new $10 million metallic sodium plant which the company is erecting at Ashtabula, Ohio. This is expected to produce 36 million lb. annually for motor fuel, steel and chemical plant consumers. Sodium metal and chlorine will be the first products of the chemical company's plants. The industrial call for sodium metal has risen in recent years because of rapidly expanding demands in alloy steel making, detergent manufacturing and requirements for making, tetra-ethyl lead. Other important uses include manufacturing high-grade sodium cyanide for heat treating and electro-plating, and also producing sodium peroxide, used in textile industry bleaching and ground-wood treatment in pulp plants. Unique features of the new plant, which is expected to be completed early in 1950, include the use of improved cell design for electrical treatment of sodium chloride from which metallic sodium is produced, better air conditioning and improved plant layout.

* * *

Development of an economical way to speed the conversion of soft coal to synthetic motor car fuel and oil, using a catalyst which, paradoxically, contains substances that by themselves interfere with the synthesis of liquid fuel, has been announced by chemists of the U.S. Bureau of Mines. Investigations showed that tin is a fairly active catalyst for promoting the direct combination of hydrogen with bituminous coal to form liquid fuel, but acids containing chlorine proved worse than ineffective, actually retarding the process. A mixture of tin with a chlorine acid, however, was found to be probably the best catalyst available. With the possibility of carbon tetrachloride or any other material which generates chlorine acids being employed. Unfortunately, the U.S.A. has only negligible domestic supplies of tin, so that this metal, if considered as a coal hydrogenation catalyst, must be used in minimal quantities. Under appropriate conditions it has been found possible to replace 90 per cent of the tin by zinc, which is much more available, without appreciable loss of catalytic effectiveness. German research on iron catalysts also has been confirmed by chemists in tests on sub-bituminous coal. With this type of promoter, they said, it is necessary to carry out the addition of hydrogen to the coal at extremely high pressures, ranging from about 7600 to more than 10,000 lb. p.s.i.

E. I. Du Pont de Nemours & Co., Inc., has discontinued the manufacture of sodium hydride and has licensed Metal Hydrides, Inc., of Beverly, Mass., to manufacture the compound under Du Pont patents. The agreement with Metal Hydrides is stated to have no bearing whatever on Du Pont's sodium hydride metal de-scaling process where the hydride is formed within the process from metallic sodium and hydrogen.

* * *

The Chemical Division of Koppers Company, Inc., has just issued a new 27-page technical bulletin describing the physical and chemical properties, and listing important industrial uses of the highly fluorescent compound, beta-methyl umbelliferone. A derivative of coumarin or 1,2-benzo-pyrone, beta-methyl umbelliferone undergoes chemical reactions typical of both the phenolic nucleus and the lactone linkage. These reactions include many of those common to both resorcinol and esters. The compound serves for the synthesis of many unusual derivatives not readily prepared from other starting materials, and is valuable as a whitening agent or optical bleach for soap and soap products and as a screening agent for the elimination of ultra-violet rays. Data and graphs showing the ultra-violet and infra-red absorption spectra, as well as the fluorescence spectra of the compound, are included in the booket, Technical Bulletin C-9-111, which may be obtained upon request to the Koppers Company, Inc., Chemical Division, Pittsburgh 19, Pa.

* * *

U.S. efforts to locate or discover a lode of tin of commercial grade in Alaska have been declared a failure by the Bureau of Mines. Describing the wartime exploration of Alaska's Potato Mountain tin placer district, one of the few places on the North American Continent where tin has ever been mined commercially, the Bureau reported that prior to 1920, 1500 tons of tin concentrate were produced near the tip of the Seward Peninsula. Nothing was done until June, 1943, when the Bureau undertook further exploration with bulldozers and placer drills. Between June and September a total of 256 drill-holes were sunk and all the principal creeks in the district were explored by drilling and trenching. No lode of tin of commercial grade has yet been found in the area.

Home News Items

Dyestuffs Factory Extension. — I.C.I., Ltd., has received Dean of Guild approval for extensions to its Grangemouth dyestuffs factory at a cost of £131,000. This sum represents part of the cost of building associated with the very extensive scheme of expansion gradually being put into effect in this section of I.C.I.

New Colour Factory.—A team of research chemists and physicists will be employed at the new factory of James Anderson & Co. (Colours), Ltd., which was opened by Provost J. O. Lang, Paisley, at Hawkhead last week. The factory, built by Scottish Industrial Estates, Ltd., is the first part of a project for expansion on this site.

Coal Output.—Britain's total production of coal last week was the highest since the week ended December 18 last year. Comparative figures are: Last week: 4,475,900 tons (deep-mined 4,171,300 tons, opencast 304,600 tons). Previous week: 4,372,200 tons (deep-mined 4,087,900 tons, opencast 284,300 tons).

Production Pledge.—About 80,000 members of the Dyers, Bleachers and Textile Workers' Union have pledged themselves to help increase production. In his presidential address at Blackpool on May 28, Mr. J. W. Dykes, of Radcliffe, said that the union would continue to play its part, believing that this was an important way of maintaining full employment, good wages and fair working conditions.

Another Rich Coal Seam.—An extensive new seam of coal, nearly 6 ft. thick, supplementing the discoveries near Lichfield and Brereton, has been located at a depth of 27,000 ft. during the sinking of a new shaft at Clipstone Colliery, Mansfield, Notts. The coal will be brought to the surface by the Koepe system and a headgear 196 ft. high. The mineral wealth of the seam has been described as almost limitless.

Allocation of Imported Honey.—The Ministry of Food has under consideration the allocation of imported honey of manufacturing grade to manufacturers who may wish to obtain supplies but who have hitherto been unable to establish an entitlement on basic usage. Traders in this category are requested to send to their local Food Office particulars of the quantity of imported honey, if any, which they could use over a twelve-monthly period. The information is required solely for the purpose of assessing the total quantity of imported honey which would be required, and does not imply that such requirements will be supplied.

Safer Spinning Oil.—Experiments are being carried out in four Lancashire spinning mills with oils which, it is hoped, will decrease the numbers of operatives affected by "mule spinners' cancer."

Eight-Oz. Oil Tins.—The relaxation of the restriction which has required the use of 1-gall. tins for the sale of certain lubricating oils is announced by the Board of Trade. The Metal Containers Licence, 1949, authorises from July 25 the manufacture and use of 8-oz. tins for cycle oil, household oil, penetrating oils, typewriter oil and light lubricating oil.

Lanarkshire Distillation Proposal.—In a brief summary of the proposal to erect in Lanarkshire a coal distillation plant capable of processing 150,000 tons of coal annually (THE CHEMICAL AGE, 60, 712) it was incorrectly stated that 375,000 tons of crude benzol might be derived from this source. This should have read as 375,000 gallons.

Miners Save Most.—Figures issued by the National Savings Committee show that the 3,000 Savings Groups in industrial concerns with 500 or more employees saved more than £5½ million during the first quarter of 1949. Total group membership in these large concerns is more than 1,227,000. Coalminers continue to lead other industrial workers with the highest savings per head, the figure being £5 0s. 4d. for the quarter over 8s. a week.

Gas Staffs Outside the TUC.—The British Gas Staffs Association at its conference in London last Saturday decided not to affiliate with the Trades Union Congress. The decision, given by a card vote, was supported by 11,425. Only 785 were in favour of affiliation. The conference unanimously agreed that present salary scales throughout the industry were inadequate and that the national council "should press for salaries which would allow gas staffs to regain the living standards to which they are entitled."

Machinery for British Steel.—The allocation of $2.73 million to Britain has been approved by the Economic Co-operation Administration for the purchase of additional machinery for three factories of Stewart & Lloyds, Ltd., at Corby, Northamptonshire, and at Clydesdale and Tolcross in Scotland. The machinery, to be bought in the U.S.A., includes electric weld tube-making equipment, a "walking drag line" for extracting iron ore at the Corby works, and equipment for finishing petroleum pipe at the other two factories.

Obituary

Second Viscount Leverhulme

THE sudden death in a Minneapolis, U.S.A., hospital on May 27 of Viscount Leverhulme, governor of Lever Bros. and Unilever, Ltd., has evoked widely spontaneous testimonies to the uncommon qualities, and especially the humanity of the man who for 24 years has borne the heavy responsibilities of directing one of the largest industrial and chemical groups in the country. Lord Leverhulme, who was 61, was taken ill while returning *via* America from a business visit to Australia. The only son of the first Lord Leverhulme, who created out of his imaginative handling of the soap trade of his father's obscure grocery store the world-wide soap and edible fats organisation, the heir imitated his father's practical start in industry, beginning as a labourer in Port Sunlight soap plants. He had the advantages, however, of an ample education, at Eton and Trinity College, Cambridge, where he graduated and acquired his M.A. in 1913, and was well fitted for the exacting responsibilities he had later to fulfill in civic, commercial and industrial organisation, in which he exhibited an uncommon capacity for understanding and promoting widely diverse interests. Included among his many public offices were those of High Sheriff of Cheshire (1923), president of the Institution of Chemical Engineers (1932-34), of the Society of Chemical Industry (1936-38), and of the London Chamber of Commerce (1931-34). His initiative contributed very largely to the formation of the British Management Council in 1936 and the recently instituted British Institute of Management. His close preoccupation with welfare and education were revealed in his personal service and benefactions bestowed on the John Benn Boys' Hostel, of which he was president, the National Institute of the Deaf and many education institutions.

Lord Leverhulme's successor is his only son, Major the Hon. William Philip Bryce Lever.

In the course of an appreciation of the late Lord Leverhulme, Sir Ernest Benn wrote: "As a person, a man and a close friend, sweetness is the word which comes most readily to mind, although seldom used in such a connection. He engendered affection and now calls forth a genuine mourning quite exceptional for a man of his position."

The death is announced, at the age of 65, of MR. J. P. MACKINNON, director and manager of the Glasgow, Falkirk and Motherwell works of Fredk. Braby & Co., Ltd., the Glasgow steel specialists and structural engineers. Mr. MacKinnon joined the staff in 1905 and was departmental manager from 1915-1939. He was closely associated with the Sheet Makers' Conference, British Metal Window Manufacturers' Association and the galvanised Tank Manufacturers' Association.

DR. JAMES DEAN OGILVIE, Milngavie, a director of James Miller, Son & Co., Ltd., chemical and general merchants, of Glasgow, until his retirement a few years ago, has died at the age of 83. He was widely known in Scotland for his extensive historical research work.

MR. SIDNEY ABBEY, of Edgerton Bank, Huddersfield, has died at his home in his 77th year. For 61 years he had been connected with James Robinson & Co., Ltd., sulphur dyestuffs manufacturers, Hillhouse Lane, Huddersfield, of which firm he was the governing director.

The death has occurred, at the age of 95, of MR. CHARLES ALEXANDER BUCKMASTER, research chemist and joint author with his father of chemistry textbooks.

The death is announced of MR. JOHN M'GOUGAN, of the firm of Perry & Hope, Ltd., manufacturing chemists, Glasgow.

Personal

PROF. F. G. YOUNG is to succeed PROF. A. C. CHIBNALL in the Sir William Dunn chair of biochemistry at Cambridge. Prof. Young will be leaving the chair of biochemistry at the University College, London, which he has held since 1945. There his main task has been to superintend the return of the biochemical department to London from where it was evacuated during the war. This has been successfully accomplished, with completely re-equipped laboratories, and a new course leading to the degree of M.Sc. in biochemistry.

Parliamentary Topics

Copper and Lead Prices.—Asked in the House of Commons by Mr. W. T. Scott-Elliott whether he is satisfied that the recently announced reduction in the selling price of copper and lead will enable British manufacturers to compete on equal terms with the manufacturers in the U.S.A., Mr. G. R. Strauss, Minister of Supply, said it was impossible to isolate the relative prices of copper and lead from the other elements affecting competition between American and British manufacturers, such as, for example, dollar shortage in many overseas markets. He was, however, broadly satisfied, after considering the views of the exporting industries mainly affected, that a temporary disparity in prices in these metals need not have any significant effect on the export of those products which it was desirable to encourage.

Calcium Carbide Price.—Mr. R. E. Manningham-Buller asked the President of the Board of Trade why the price of calcium carbide produced by a Government-owned plant in South Wales and that imported by the Government had been increased by £2 15s. per 1000 kilos. Mr. John Edwards, Parliamentary Secretary to the Board of Trade, said that the increase on April 1 last was to bring the price into line with current costs of production. The questioner asked if this was not the second increase in Government-produced carbide, and was it not correct that there had been no rise in cost of carbide produced by private enterprise. Was not this another case of Government enterprise leading to increased costs to consumers? Mr. Edwards: No, sir. Other members emphasised the discrepancy between costs of Government and privately-owned factories. In reply, Mr. Edwards said that it was the business of the Government to cover costs of production.

TOWARDS EXPORT TARGETS

A SURVEY of the achievements so far attained by British industry towards the export targets set for the end of 1949 was given in last week's *Board of Trade Journal*.

The following figures show exports in April with (in brackets) the target for the end of 1949 in some of the major items, in £ million :—

Iron and steel 9.90 (10.50); non-ferrous metals 5.21 (4.00); scientific instruments (including photographic) 0.93 (1.04); chemicals, drugs, etc., total 6.89 (9.00), comprised of chemicals, dyes and dyestuffs, paints, pigments, varnishes, etc., 5.31 (7.25) and drugs and medicines 1.58 (1.75).

Posed as a Chemist

A 27-year-old manager who posed, among other rôles, as an industrial chemist and said he was in a position to manufacture chloride of lime was sentenced to three years' imprisonment at the Old Bailey last week. He was John Albert Mann, of Queens Crescent, Kentish Town, carrying on business as Mann & Co. (Chemicals), Ltd., at High Street, Harlesden, N.W., and after a five-day trial the jury found him guilty on nine counts of obtaining £6000 by false pretences with intent to defraud.

Mr. Gerald Howard (prosecuting) said the first person to be defrauded was a Mr. K. Burton, director of Intersales, Ltd., export merchants of Basinghall Street, E.C. Mann told Mr. Burton he was a qualified industrial chemist and a B.Sc. and was in a position to manufacture chloride of lime. Mr. Burton advanced Mann £200 for this purpose, and in August 1948 premises were rented at 36a High Street, Harlesden where the chloride of lime was to be manufacted.

Mr. Burton, relying on what Mann had told him, accepted orders for chloride of lime. Cheques for £708 and £1,229 were paid to Mann against delivery, but no deliveries of the genuine article were ever made. On one occasion the defendant "fulfilled" one order by dispatching to Spain a consignment of untreated lime and prepared bogus analytical certificates to cover up what he had done.

Counsel alleged there had been a number of other instances in which Mann had obtained money by false pretences, from a Mr. R. Hingorani, London representative of a Bombay corporation, who was stated to have advanced £1,800 in connection with a bogus scheme for the production of caustic soda, and from Mr. M. Gilbert, of Harlesden, who agreed to invest £2,000 in Mann's company. Reference was also made to the "Clarkson Group of Analytical Companies" under whose auspices bogus analytical certificates were issued.

A detective inspector said that Mann, when arrested in Dublin, had with him a suitcase with a "vast quantity" of false documents including what appeared to be university diplomas, "for degrees in almost every subject under the sun." In a period of four months at least £12,000 had disappeared and much civil litigation had been caused by Mann's practices.

CHEMICAL EMPLOYMENT

STATISTICS of employment in the chemical and allied industries in Great Britain in the month of March, published in the current *Ministry of Labour Gazette*, show very little change in numbers.

Sectional distribution of labour was as follows :—

	(Thousands) Mar. 1949	Feb. 1949	Mid. 1948
Coke ovens and by-product works	17.6	17.6	17.3
Chemicals and dyes	196.8	196.6	195.5
Pharmaceutical preparations, etc.	31.7	32.0	30.8
Explosives and fireworks ...	36.8	36.2	33.8
Paint and varnish	37.2	37.1	37.0
Soap, candles, glycerine, etc.	47.9	47.8	46.9
Mineral oil refining	33.8	33.6	30.7
Other oils, greases, glue, etc. ...	30.2	30.2	28.9
Total, chemical and allied trades	432.0	431.1	420.9

Overseas News Items

Exchanging Heavy Water for Uranium.—Norway is interested in exchanging heavy water for Swedish uranium, states the *Göteborgs Handels-och Sjöfarts-Tidning*. Although the Norwegian uranium deposits contain 800 grammes of uranium per ton of ore, and the Swedish only 200 grammes per ton, Norway is said to consider it best for both countries if Sweden undertakes the extraction of uranium.

Uranium in Central Australia.—The occurrence of a large uranium field in the Hartz range about 200 miles north-east of Alice Springs, in Central Australia, has been verified by geologists and geophysicists of the Bureau of Mineral Resources. Highly radioactive minerals had been found at Lone Pine which had been worked for mica. The uranium is contained in heavy black stone which mica miners have been accustomed to throw away.

Exploiting French Natural Gas.—The Régie Autonome des Petroles is seeking to extend the area it already exploits in the Saint-Gaudens region where it is obtaining excellent results with combustible mineral gases. It has also asked for three exclusive permits for liquid hydrocarbon and gas research in other regions in France—Dombes and part of Bresse where natural gas is already used to supply Amberieu, in Provence and between Bellgarde and Roche-sur-Foron.

Researches on Synthetic Fibres.—The Monsanto Chemical Company, St. Louis, Ms., and the American Viscose Corporation, Philidelphia, Pa., have joined forces in the formation of a new company, as yet unnamed, which will be engaged in research and development work in the field of synthetic fibres. Head of the new firm will be Dr. Carroll A. Hochwalt, of Dayton, Ohio, a Monsanto vice president. The work will be pursued through the laboratories of Monsanto and American Viscose.

New Ruhr Coal Mines.—Plans have been completed for the opening up of several coal deposits in the Ruhr area in order to bring about the increase of Ruhr coal output asked for by the Allied and the German authorities. Three mines with two shafts each are to be sunk on the Lower Rhine with an estimated output of 5000 tons daily. New mines are also being established in the Recklingshausen region with the most modern equipment. These are expected to be in operation in 1952.

World Trade Fair in Toronto.—The second Canadian international trade fair was opened in Toronto last Monday by Mr. Charles Sawyer, United States Secretary of Commerce, and attended by Mr. Howe, Canadian Minister of Trade and Commerce, and Mr. Wilson, President of the British Board of Trade. Products on display are from 35 countries, and more than 60 per cent of the exhibits are from abroad.

More Brazilian Iron and Steel.—The annual report for 1948 of the Cia. Siderurgica Nacional, which operates the Brazilian national steel plant at Volta Redonda, showed that all the manufacturing units of the plant, some of which were still incomplete at the end of 1947, came into operation during the year. The production of pig iron from the blast furnace has reached the equivalent of an annual rate of 224,025 tons and there has been a considerable increase in output of by-products, such as coke, motor fuel and tar. The Cia. Acos Especiais Itabira, a privately owned concern to produce high-grade steel in the State of Minas Gerais, announces that its blast furnace, which is said to be one of the largest charcoal burning units of its kind, is expected to be in operation during the second half of 1949.

INDIAN SOAP INDUSTRY

THE All-India Soap Manufacturers' Association has protested against the reported grant of permission to a foreign firm to manufacture soap in South India and has urged the Government of India to withdraw the sanction.

A committee of the association which met in Bombay, adopted a resolution viewing "with great anxiety and concern proposals to permit foreign companies to manufacture soap, as they are convinced that this would not only spell ruin to this useful industry, but also result in growing unemployment and distress to labour."

The association, which claims a membership of 70 leading soap manufacturers throughout the country, states in its resolution that the Indian soap industry has an installed capacity of more than 225,000 tons.

The resolution said that the industry was fully equipped with financial and other resources, to expand and satisfy the country's full requirements at any time. India, therefore, need not depend on foreign countries for soap and so lose valuable foreign currency. The by-product glycerine could be exported to hard currency areas.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

SANOPER, LTD., Manchester. (M., 4/6/49.) April 11, charge, to Westminster Bank, Ltd., securing all moneys due or to become due to the bank; charged on land and works and offices at Cobden Street, Lower Broughton, and fixtures. *Nil. September 2, 1948.

SOLARTRON LABORATORY INSTRUMENTS, LTD., Kingston-on-Thames. (M., 4/6/49.) April 6, series of £6000 debentures, present issue £3030; general charge.

WELSH METAL INDUSTRIES, LTD., Birmingham. (M., 4/6/49.) April 13, £25,000 charge, to H.M. Treasury Solicitor; charged on certain lands part of Beddau Farm, Beddau Eglwysilan, and a general charge (subject to etc.). *£177,322. November 17, 1948.

Satisfactions

ALUMINIUM PROTECTION CO., LTD., London, E.C. (M.S., 4/6/49.) Satisfaction, April 22, of debenture registered August 27, 1936.

BITUMINOUS COMPOSITIONS, LTD., Sandal, near Wakefield. (M.S., 4/6/49.) Satisfactions, April 11, £5000, registered October 6, 1933, and of charge registered October 18, 1941, to the extent of £325.

PICCADILLY LABORATORIES, LTD., London, W. (M.S., 4/6/49.) Satisfaction April 24, of a mortgage registered December 20, 1948, so far as it relates to 189 Queens Road, Hastings (no part of the mortgage moneys having been repaid).

TAMPIMEX OIL PRODUCTS, LTD., London, W.C. (M.S., 4/6/49.) Satisfaction April 22, of charges registered December 4, 1941, and May 1, 1942.

Receivership

METAL CHEMICAL FINISHES (LIPHOOK), LTD., 6 Eldon Street, E.C.2. (R., 4/6/49.) Mr. P. F. Cansdale was appointed receiver and/or manager on February 22, 1949, under powers contained in debenture dated June 25, 1948.

Company News

The name of **Builders Chemicals (Newcastle), Ltd.,** 64 Reid Park Road, Newcastle-on-Tyne, has been changed to **French (Builders Chemicals), Ltd.**

The address of **The Coal Tar Research Association** has been changed to Oxford Road, Gomersal, near Leeds.

The new head office and additional works of **Ibbetson & Co.** has opened at River Road, Barking, Essex.

The registered capital of **William Vale, Ltd.,** has been increased from £5000 to £8000.

New Companies Registered

Aslib. (468,856). Registered May 24 as a company limited by guarantee without share capital with 1000 members. Objects: To acquire the assets and liabilities of the Association of Special Libraries and Information Bureaux, and of the unincorporated association known as the British Society for International Bibliography; to advance and promote documentation and the study of bibliographical methods, etc. Subscribers: C. Le Maistre, J. F. Stanley, T. M. Herbert, B. Fullman, I. Shrigley, J. E. Wright and A. E. Cummins, librarian, Chemical Society, Burlington House, W.1. The management is vested in a Council, the first members of which are not named. Solicitors: Hargrove & Co., 46 Old Bond Street, W.1.

British Dielectric Research, Ltd. (468,636). Private company. Capital £100. Objects: To promote and participate in research and development relating to solid, liquid and gaseous dielectric materials, conductive materials, etc. Directors: P. V. Hunter, Dr. J. L. Miller, Dr. L. G. Brazier, P. A. Sporing and W. C. Handley. Reg. office: Norfolk House, Norfolk Street, W.C.2.

K.E. Trading Co., Ltd. (468,899). Private company. Capital £100. Manufacturers of electronic devices, materials, etc. Director: V. H. Frank. Reg. office: 6 Draper's Gardens, E.C.2.

Plastic Nupak Co., Ltd. (468,787). Private company. Capital £1000. Manufacturers of plastic tubes and containers, etc. Directors: J. G. Fletcher, J. E. R. Macdonald and T. F. Ellison. Secretary: J. E. N. Brough, 15 Victoria Road, Harrogate.

Vernon Laboratories, Ltd. (468,681). Private company. Capital £100. Manufacturers of chemicals, gases, etc. Directors: A. E. Stannard, E. I. Crawshaw and G. B. McGann. Reg. office: Church Road, Fleet, Hants.

Chemical and Allied Stocks and Shares

VALUES in stock markets have lost further ground, international and home news continuing to make for caution, and with buyers few and far between, moderate selling had a disproportionate influence. Moreover, sentiment was also affected by a further setback in British Funds, 2½ per cent Consols and Treasury Bonds and also the long-dated nationalisation stocks having encountered selling. Reports of growing competition in export markets again had a dominating influence on the industrial and kindred sections.

As was to be expected, shares of chemical and allied companies have declined again with the general trend of the markets. Imperial Chemical were back to 45s. 9d., at which there is a yield of over 4¼ per cent on the basis of the 10 per cent dividends which have ruled in recent years. Following the annual meeting and Lord McGowan's reply to the nationalisation threat, the shares were inclined to strengthen.

Albright & Wilson 5s. ordinary kept steady at 29s. 3d. following the news that the company is applying to the Capital Issues Committee for permission to issue a million new preference shares. Fisons changed hands around 46s., F. W. Berk 2s. 6d. ordinary eased to 14s. 3d., Boake Roberts 5s. shares were steady at 30s. 6d., with Burt Boulton at 27s. 9d., Bowman Chemical 4s. shares at 7s., and Amber Chemical 6s. 9d.

Brotherton 10s. shares held firm at 20s. 9d., and Monsanto Chemical new were 53s. 7½d. compared with the issue price of 52s. 6d. Sanitas Trust 10s. ordinary kept at 26s. 3d. Among preference shares, British Chemical & Biologicals 4 per cent were 20s. 9d., W. J. Bush 5 per cent 25s. 9d., and L. B. Holliday 4½ per cent 22s. 10½d.

Shares of companies connected with plastics were still depressed, with Erinoid 5s. ordinary at 6s. 6d., British Industrial Plastics 4s. 4½d., De La Rue 32s. 9d., and British Xylonite 68s. 9d., while Kleemann were 10s. 6d.

The 4s. units of the Distillers Co. fell back to 26s. 6d , Associated Cement reacted to 76s. 9d., and British Plaster Board 5s. shares were 21s. General Refractories at 24s. were also lower, and Levers eased to 46s. and Lever N.V. to 43s. 1½d.

United Molasses have fallen to 42s. 7½d., further selling having followed since the decision to postpone distribution of a share bonus until the general outlook is less uncertain. Awaiting the financial results. British Match kept steady at 35s. 6d., but British Aluminium eased to 46s. 9d., Borax Consolidated deferred were 52s. 6d., and Dunlop Rubber reacted further to 63s. Turner & Newall at 76s. 6d. were also down with the general trend.

Iron and steels have been reactionary. Guest Keen fell to 45s. on the news that the company is to apply to the Capital Issues Committee to make an issue of new ordinary shares to bring in £4½ millions. Babcock & Wilcox came back to 69s. 3d., and Allied Ironfounders to 63s. 6d. Staveley at 88s. 6d. were lower on balance, while Stewarts & Lloyds eased to 55s. 9d. and United Steel to 29s. 6d.

Glaxo Laboratories, although active on bonus prospects, have reacted to £20½ at the time of writing. Since publication of the full results, British Drug Houses 5s. shares have eased to 7s. British Glues & Chemicals 4s. shares provided a firm feature at 19s. 3d. Triplex Glass eased to 20s. 9d. and Evans Medical to 41s. 3d. Awaiting the financial results, Boots Drug have fluctuated around 53s.

Oils were lower, with Shell at 65s. pending the full report and accounts, and Anglo-Iranian slightly below £7⅞, the preliminary figures being due shortly in this case. Wakefield fell sharply to 60s., the setback in profits coming as a surprise to the market.

British Chemical Prices

Market Reports

MANCHESTER.—Traders on the Manchester chemical market have been dealing with a steady flow of new inquiry for the alkalis and other regular lines, and in the aggregate additional business has been fairly satisfactory. Textile and other industrial users of chemicals in this area are calling for good deliveries under existing contracts, especially of soda ash, bicarbonate of soda, caustic soda, and the potash compounds. Prices mostly remain steady, though there are a few easy sections. Interest in the general run of fertilisers is less in evidence as the end of the season approaches. In the by-products market trade remains patchy, with, however, a fairly steady demand for carbolic and most of the light distillates.

GLASGOW. — The volume of business latterly transacted in the Scottish chemical market has been on a slightly reduced scale and prices have continued to recede. The demand, however, for coal-tar products in particular continues to increase. Most materials are now available for prompt delivery. The export market has again been quiet and generally featureless.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 *and* 50 *inclusive, or a woman between the ages of* 18 *and* 40 *inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.*

APPLICATIONS are invited from Qualified Engineers, B.Sc. or A.M.I.Mech.E., for important Chemical Works, Manchester area. Applicants should not be over 40 years of age, and have experience in maintenance, chemical plant erection and design. Position offered is permanent and progressive. Only men of proved ability need apply. Address in first instance, with particulars of qualifications and experience in detail, and salary expected. Box No. 2817, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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Candidates should be aged 28 or over and have a good Honours Degree, or equivalent, in Chemistry. They should be Physical Chemists with research experience in Organic and Colloid Chemistry. A practical knowledge of petroleum and coal-tar products and experience of the chemistry and physics of natural and synthetic rubbers would be an advantage.

Selected candidate will be appointed in either of the following grades, according to qualifications, etc. :—

Principal Scientific Officer : £910-£1,177.

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Write, quoting F.393/49A, to **Technical and Scientific Register (K), York House, Kingsway, London, W.C.2,** for application forms, which must be returned by 9th July 1949.

17.5.A.41(30).

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CHEMIST required by well-established London Manufacturing Chemists to specialise on the research and development of Disinfectants and Detergents. Good Degree, up-to-date knowledge and previous experience essential. Commencing salary, £1,000 per annum, plus bonus. Write, giving fullest details of age, qualifications, experience and present and former employers, which will be treated in the strictest confidence, to Managing Director, Box No. 2810, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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Candidates must possess at least Higher School Certificate, Higher National Certificate, or equivalent. They should have general chemical experience, particularly in fields of Physical Chemistry and Chemical Engineering. Special knowledge or interest in modern analytical methods, thermochemistry and combustion, stability and sensitivity of explosives, instrumentation plastics (with special reference to aircraft materials), chemical plant development or library and information work an advantage.

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23.5A22(30)

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